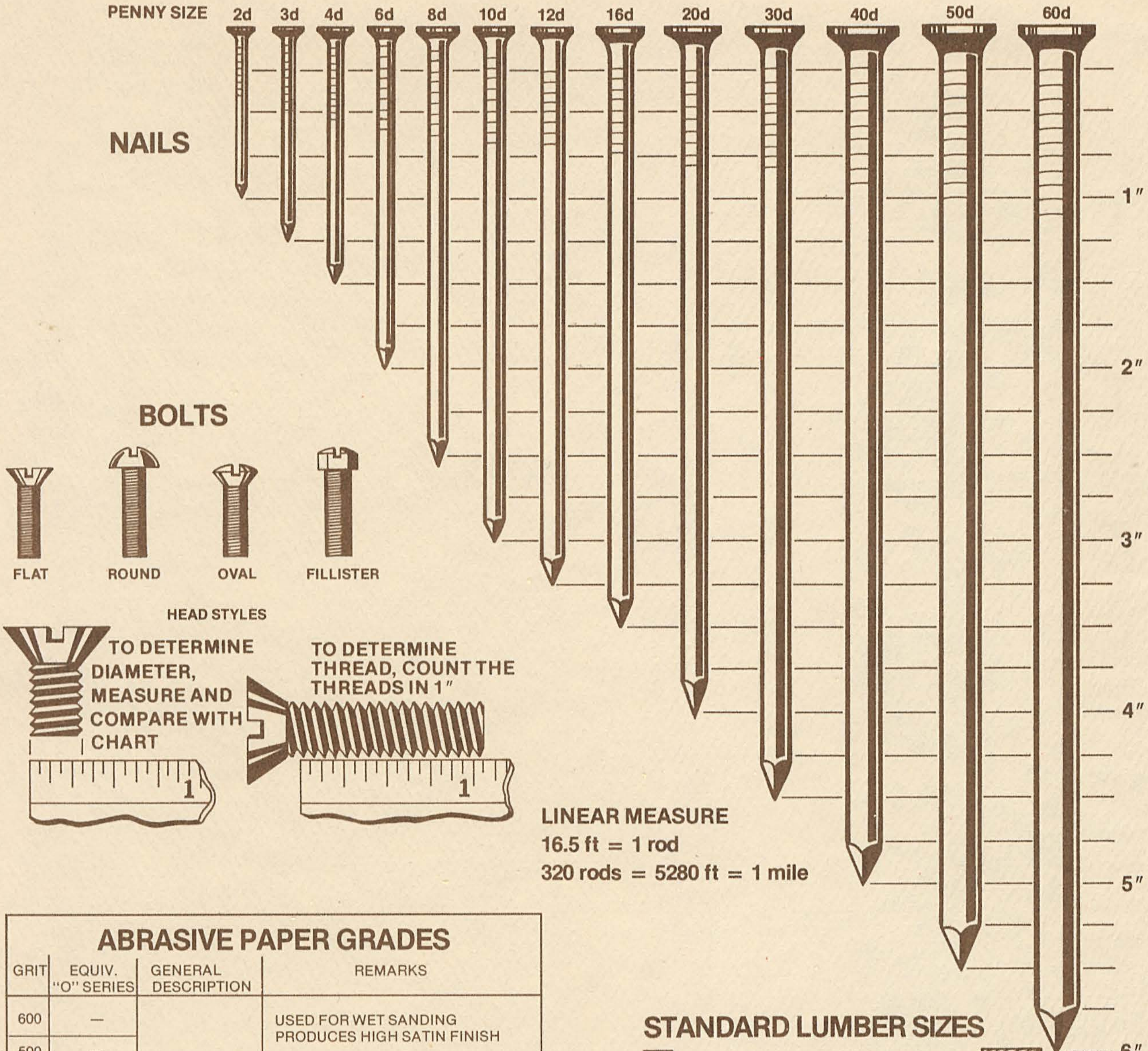
Popular
Mechanics

do-it-yourself encyclopedia

SHOP GUIDE

NAILS


PENNY SIZE
2d
3d
4d
6d
8d
10d
12d
16d
20d
30d
40d
50d
60d
1"
2"
3"
4"
5"
6"

BOLTS

FLAT
ROUND
OVAL
FILLISTER

HEAD STYLES

TO DETERMINE DIAMETER, MEASURE AND COMPARE WITH CHART
1
TO DETERMINE THREAD, COUNT THE THREADS IN 1"
1

LINEAR MEASURE

16.5 ft = 1 rod

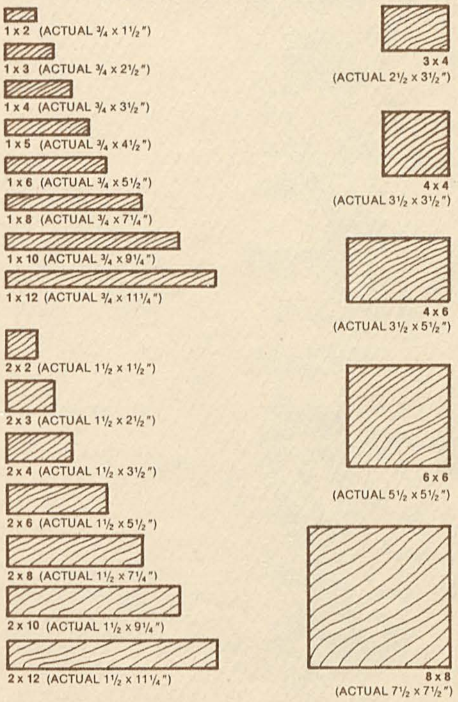
320 rods = 5280 ft = 1 mile

ABRASIVE PAPER GRADES

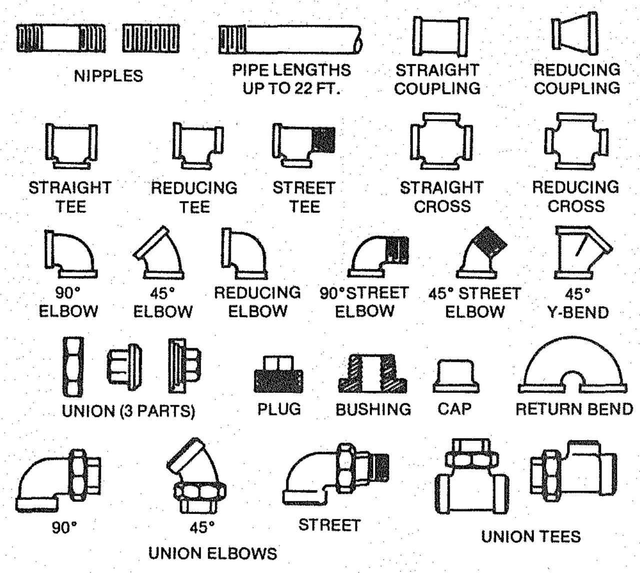
GRIT	EQUIV. "O" SERIES	GENERAL DESCRIPTION	REMARKS
600	—	SUPER-FINE	USED FOR WET SANDING PRODUCES HIGH SATIN FINISH
500	—		
400	10/0		GENERAL RANGE OF ABRASIVE PAPERS USED FOR WET SANDING LACQUER AND VARNISH TOP COATS
360	—		
320	9/0		
280	8/0	VERY FINE	USED FOR DRY SANDING ALL FINISHING UNDERCOATS. THESE GRADES WILL NOT SHOW SANDING MARKS
240	7/0		
220	6/0*		
180	5/0	FINE	FOR FINAL SANDING OF BARE WOOD. GOOD FOR SMOOTHING OLD PAINT
150	4/0*		
120	3/0	MEDIUM	USE FOR GENERAL WOOD SANDING. GOOD FOR FIRST SMOOTHING OF OLD PAINT, PLASTER PATCHES
100	2/0*		
80	1/0		
60	½*	COARSE	USE No. ½ FOR ROUGH-WOOD SANDING. No. 1 IS COARSEST PAPER WHICH CAN BE USED TO ADVANTAGE WITH PAD SANDER
50	1		
40	1½		
36	2	VERY COARSE	ALL TOO COARSE FOR PAD SANDERS. THESE GRADES REQUIRE HEAVY MACHINES AND HIGH SPEED TO CUT WELL
30	2½		
24	3		

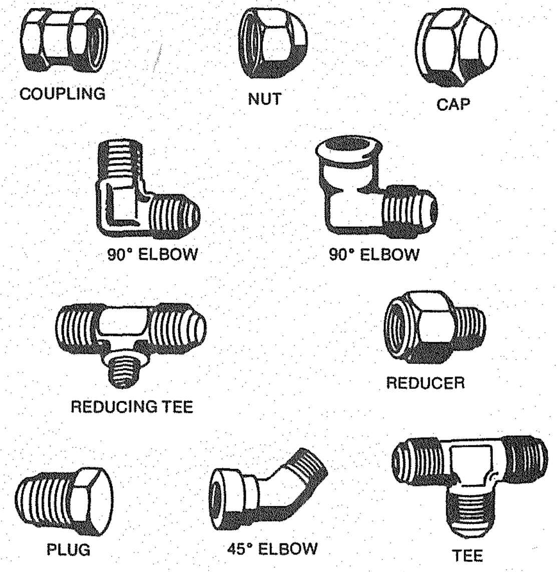
Grades generally supplied as Very Fine, Fine, Medium and Coarse

STANDARD LUMBER SIZES



PIPE FITTINGS





Here are the common steel pipe fittings. Nipples are simply short lengths of pipe threaded on both ends. Reducing fittings join two different sizes of pipe.

Compression fittings of the flared-tube type are the easiest for the novice to handle when working with copper tubing.

STANDARD STEEL PIPE
(All Dimensions in Inches)

Nominal Size	Outside Diameter	Inside Diameter	Nominal Size	Outside Diameter	Inside Diameter
⅛	0.405	0.269	1	1.315	1.049
¼	0.540	0.364	1¼	1.660	1.380
⅜	0.675	0.493	1½	1.900	1.610
½	0.840	0.622	2	2.375	2.067
¾	1.050	0.824	2½	2.875	2.469

SQUARE MEASURE

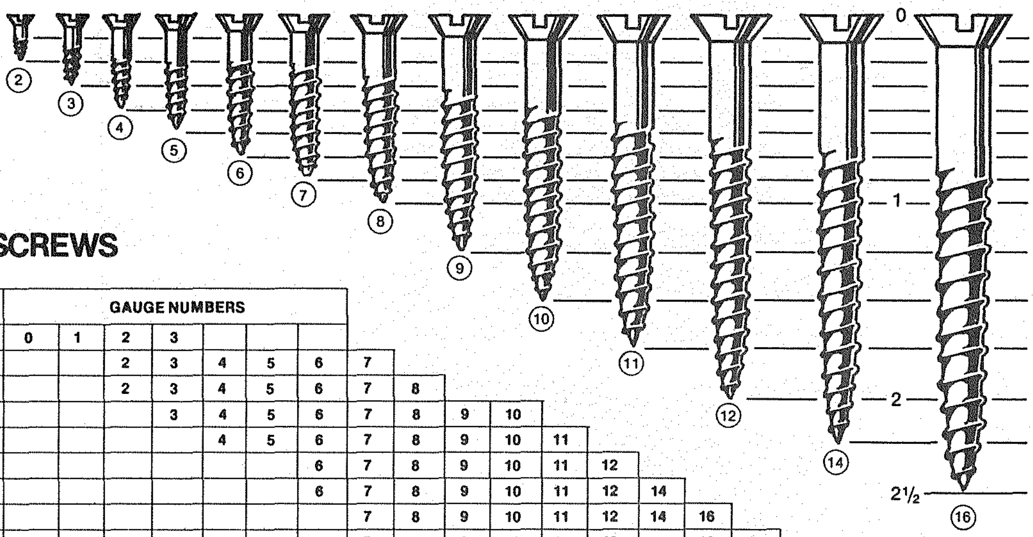
144 sq in = 1 sq ft
9 sq ft = 1 sq yd
272.25 sq ft = 1 sq rod
160 sq rods = 1 acre

VOLUME MEASURE

1728 cu in = 1 cu ft
27 cu ft = 1 cu yd

MEASURES OF CAPACITY

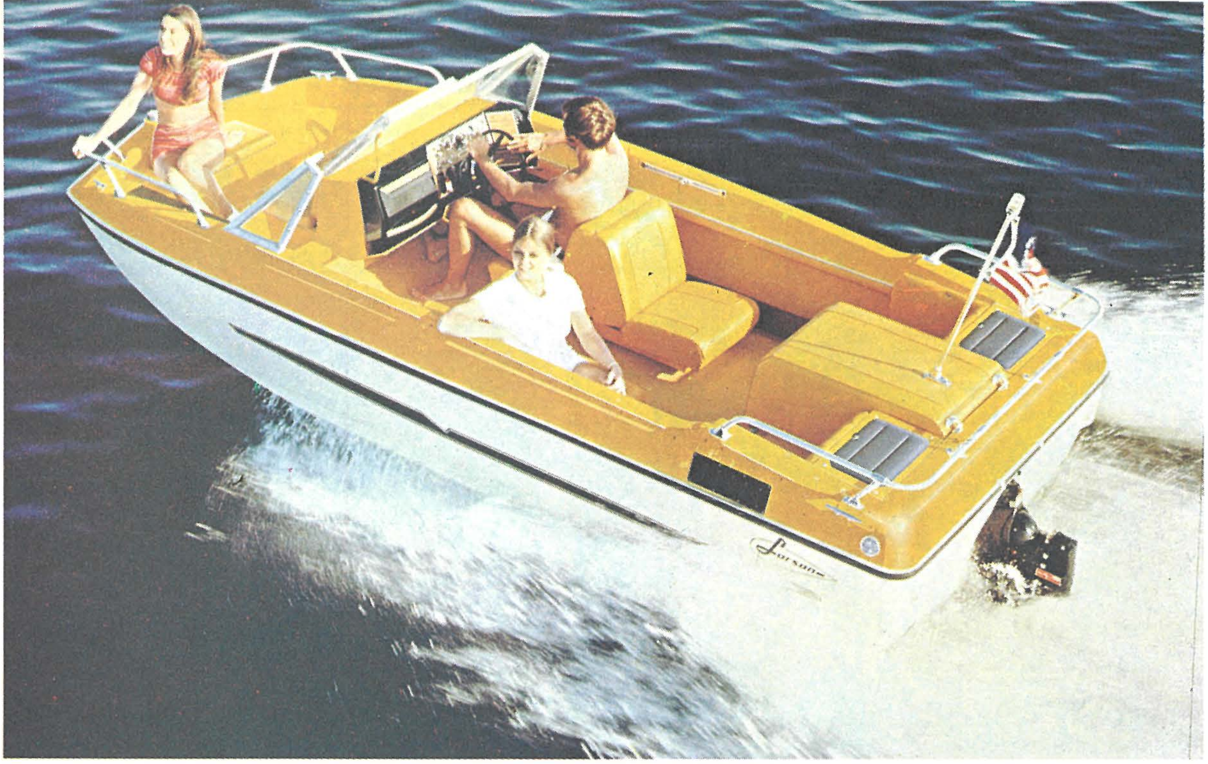
1 cup = 8 fl oz
2 cups = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
2 gallons = 1 peck
4 pecks = 1 bushel



WOOD SCREWS

LENGTH	GAUGE NUMBERS																	
¼ INCH	0	1	2	3														
⅜ INCH			2	3	4	5	6	7										
½ INCH			2	3	4	5	6	7	8									
⅝ INCH				3	4	5	6	7	8	9	10							
¾ INCH					4	5	6	7	8	9	10	11						
⅞ INCH							6	7	8	9	10	11	12					
1 INCH							6	7	8	9	10	11	12	14				
1¼ INCH								7	8	9	10	11	12	14	16			
1½ INCH							6	7	8	9	10	11	12	14	16	18		
1¾ INCH									8	9	10	11	12	14	16	18	20	
2 INCH									8	9	10	11	12	14	16	18	20	
2¼ INCH										9	10	11	12	14	16	18	20	
2½ INCH													12	14	16	18	20	
2¾ INCH														14	16	18	20	
3 INCH															16	18	20	
3½ INCH																18	20	24
4 INCH																18	20	24

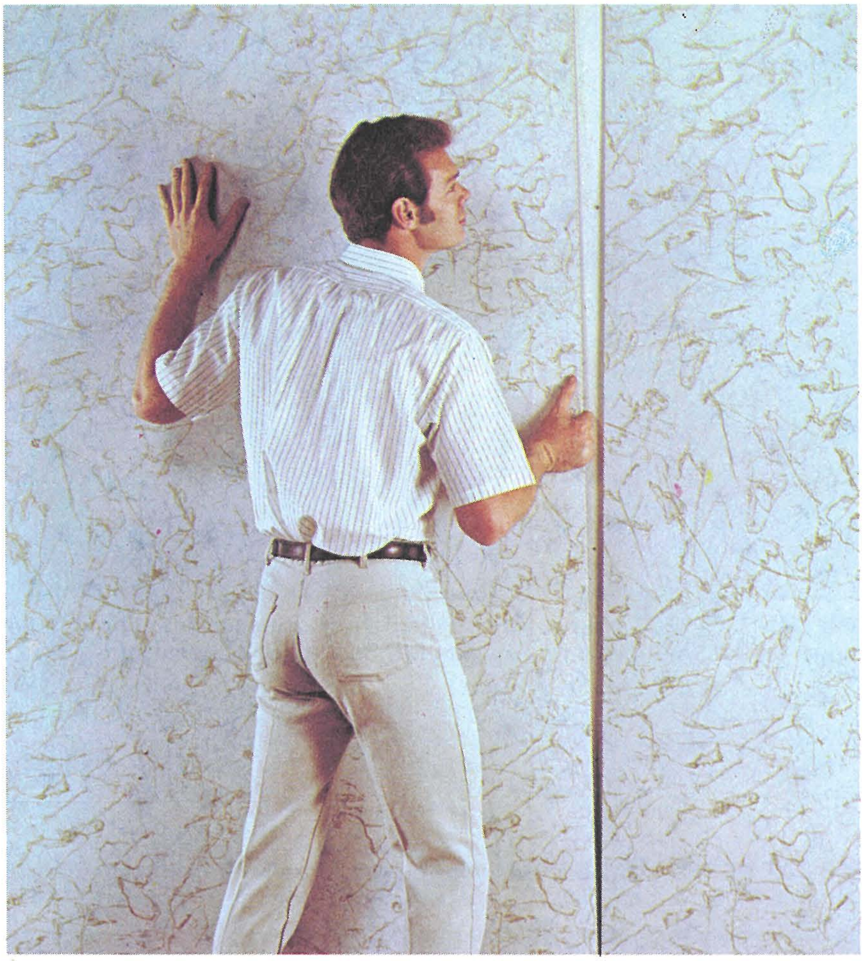
WHEN YOU BUY SCREWS, SPECIFY (1) LENGTH, (2) GAUGE NUMBER, (3) TYPE OF HEAD—FLAT, ROUND, OR OVAL, (4) MATERIAL—STEEL, BRASS, BRONZE, ETC., (5) FINISH—BRIGHT, STEEL BLUED, CADMIUM, NICKEL, OR CHROMIUM PLATED.



YOU CAN'T EXPECT your stern drive to deliver peak performance through an entire season. It's important that you give a mid-season lift. See the instructions on page 2152.

In this volume . . .

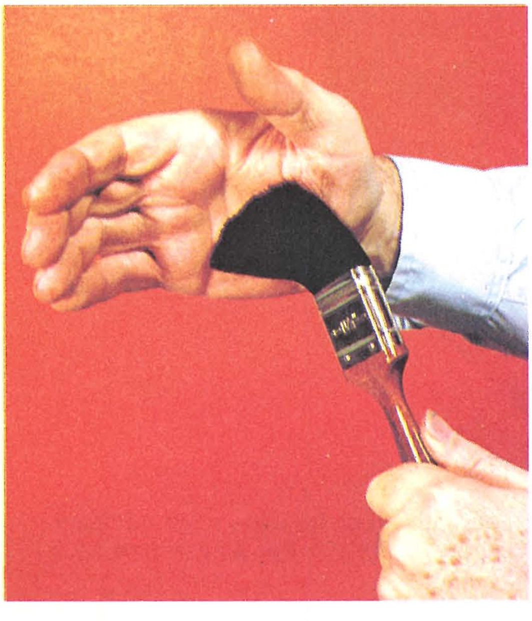
FOR TOP PERFORMANCE from your outboard, see the really complete 21-page article which takes you step by step through outboard servicing. It starts on page 2127.

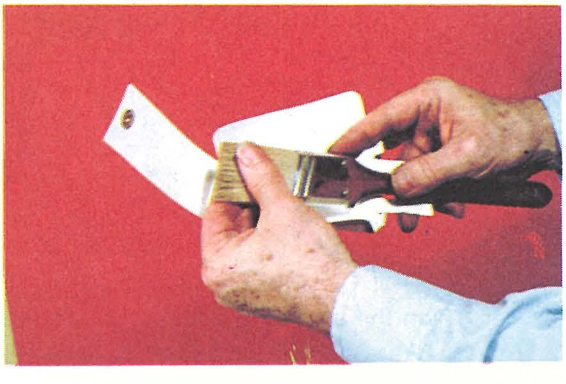


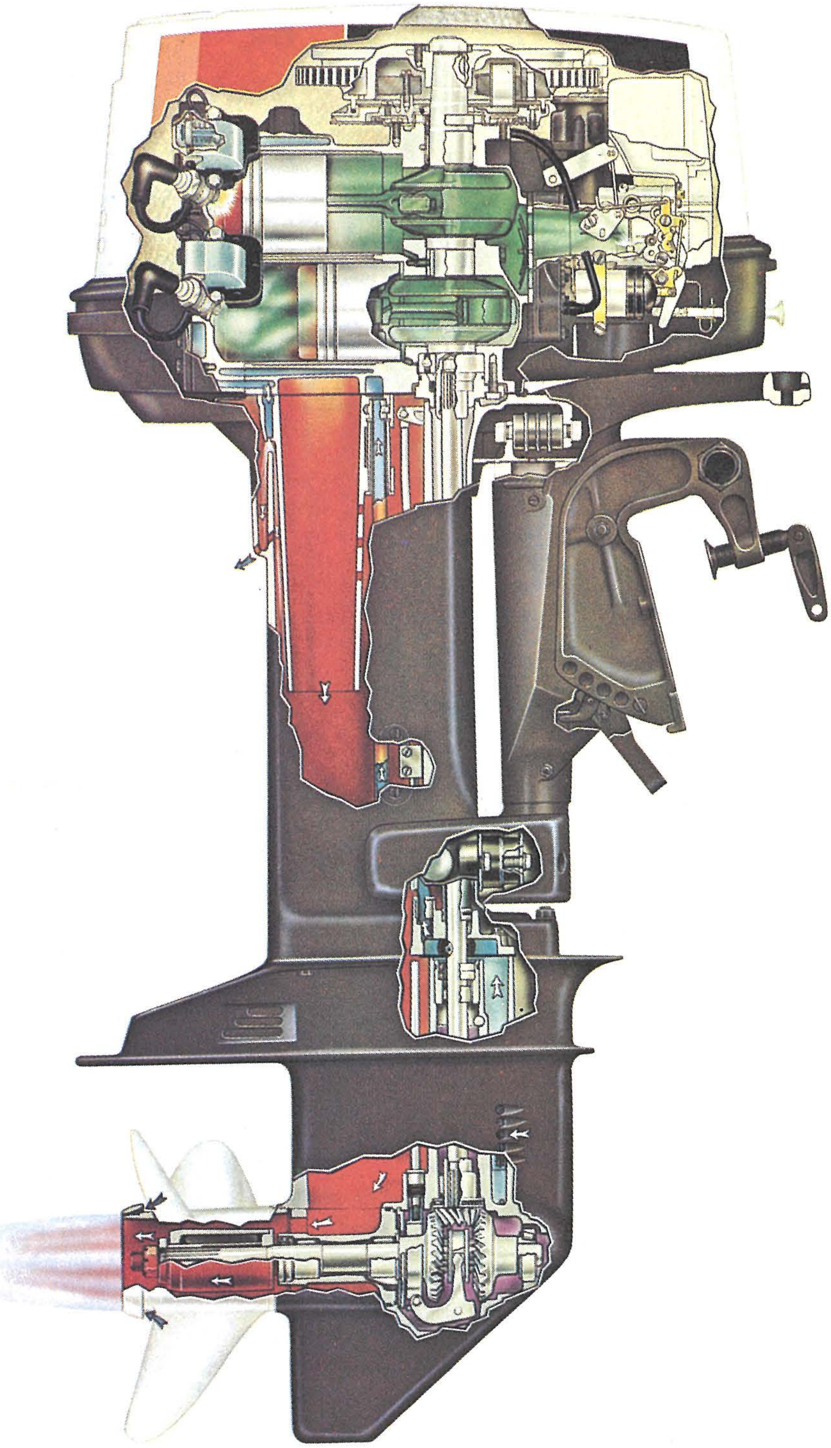
HARDBOARD wall paneling can totally transform a room within a few hours. It is easy to install against an existing wall (right) or a brand new stud wall. It presents a finished appearance the moment it is installed. The stone pattern below is by Masonite and is called "Chapel Stone." See Hardboard wall paneling on page 2210

AN ELABORATE GARDEN WALKWAY—or a simple path—not only is a convenience, but can set off your home in beautiful style. See the suggestions on page 2244.

YOU MAY USE the most expensive paint, but unless you also use a brush designed for the job your work will be shoddy. Find tips on selecting the right brush on page 2180.







THE OUTBOARD ENGINE is an engineering triumph—in some ways more complex than the engine in your car. It requires precise servicing, too. For details, see page 2127.

Popular Mechanics do-it-yourself encyclopedia

in 18 volumes

a complete how-to guide for the homeowner, the hobbyist—and anyone who enjoys working with mind and hands!

All about:

- home maintenance
- home-improvement projects
- wall paneling
- burglary and fire protection
- furniture projects
- finishing and refinishing furniture
- outdoor living
- home remodeling
- solutions to home problems
- challenging woodworking projects
- hobbies and handicrafts
- model making
- weekend projects
- workshop shortcuts and techniques
- hand-tool skills
- power-tool know-how
- shop-made tools
- car repairs
- car maintenance
- appliance repair
- boating
- hunting
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volume 12

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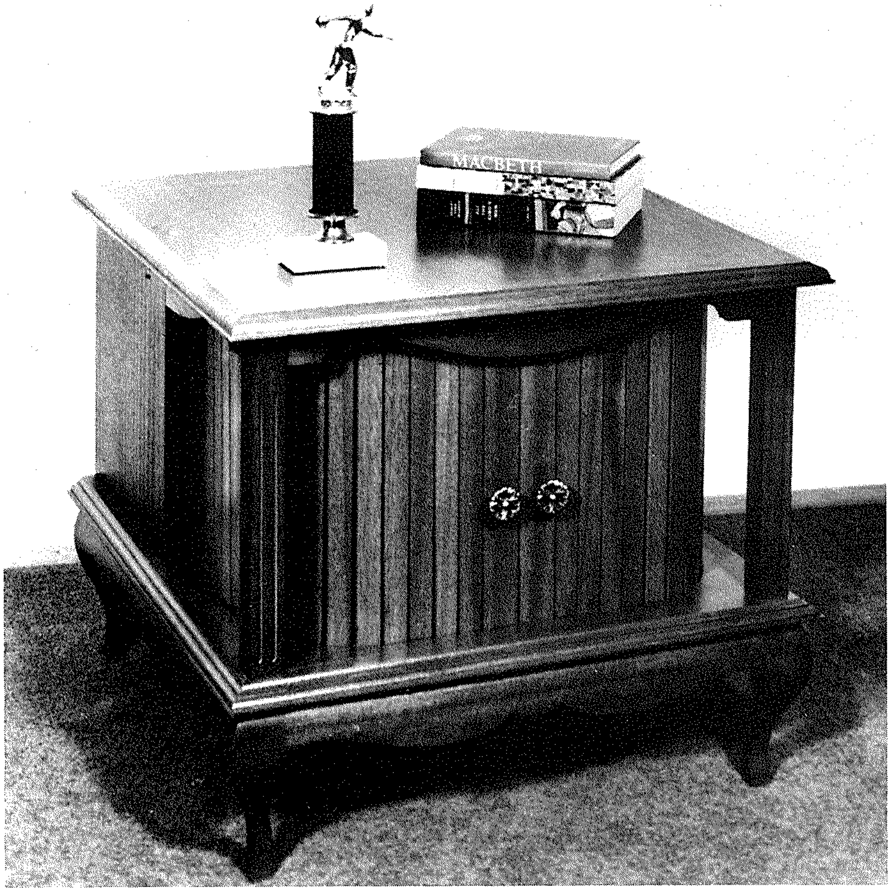
A special 'touch' in this occasional table is the tambour doors that slide open easily on a curved track



A charming French Provincial table

By C. L. WIDDICOMBE

▪ CONSTRUCTED OF cabinet-grade ¾-in. mahogany plywood, this handsome occasional table of French Provincial design can be used singly, or in pairs, in living room or bedroom. Though not a project for a beginning woodworker, it is easier to build than it looks. The design, however, does require the use of some sophisticated shop equipment such as a bandsaw, router and table saw. The original table shown above is one of a pair; if your need is for a couple of end tables, you can save time by doing all the cutting and assembly for both at the same time.

Begin work by cutting the top and bottom pieces 19½ x 21¼ in. and face three edges with ¾ x 1¾-in. strips of solid stock. These are mitered at the front corners and attached with glue and splines. Then shape the three edges with your router. The grooves in which the doors slide are ¼-in. deep by ½-in. wide. These are made using a router, collars and template. The template is simply a piece of ¾-in. plywood cut to a size that will result in a groove cut in the bottom of the top and the top of the bottom when the router collar is guided around the outer edge. Next, run a blind rabbet along the back to accommodate the back panel. Then cut a slot at a 45° angle and tangent to the back circles. This tangent slot permits insertion of the doors from the back after

SEE ALSO

Bridge tables . . . Butcher block . . . Butler's tables . . . Coffee tables . . . Dining tables . . . Game tables . . . Hutch tables . . . Party tables . . . Twin-bed tables

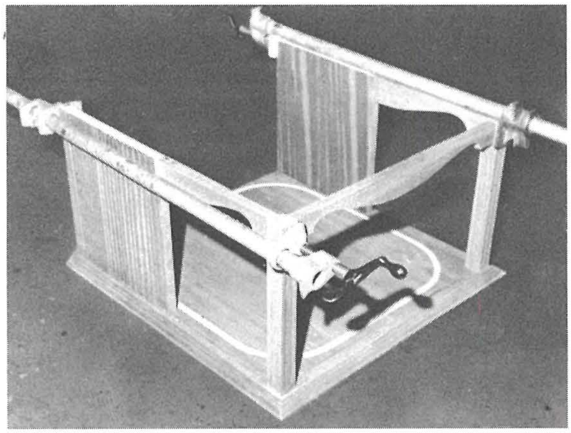
which the slot is filled in with a small piece.

Make up the two corner posts and the front rail from the pattern given and attach the front rail to the corner posts with dowels or mortise-and-tenon joints, and then secure this subassembly to the front of the bottom by driving screws up through the corner of the plywood and into the end of the corner posts. Next, cut the two 11 x 12½-in. plywood sidepieces and cover the exposed front edges with wood tape. Bandsaw the two side rails, dowel them to the posts and side panels, then drive three 2-in. No. 8 fh screws up through the bottom and into the side panels.

The base is composed of four feet and rails. The feet are bandsawed from blanks of 2⁷/₁₆-in.-sq. stock. These can be either laminated or solid blocks. The front and side rails are of stock thick enough to follow the contour of the tops of the legs.

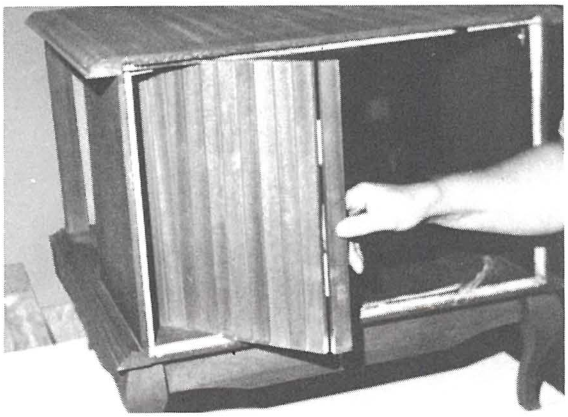
In the original, I used ⅞-in. mahogany backed up by ¾-in. maple as shown in the details. Cut the leg and rail blanks to the correct lengths and mark them for dowels. Notice that the back rail is simply a flat board cut from ¾-in. stock. Take care that the dowel holes are positioned in such a manner that they won't show when the contours of the feet and rails are cut. Bandsaw the four legs and remove excess material from the rails on your table saw. Now assemble the base section. Plane the rails and tops of the feet to match and finish up with a thorough sanding of all members. After attaching the four corner blocks, the completed base should look like that shown on page 2119.

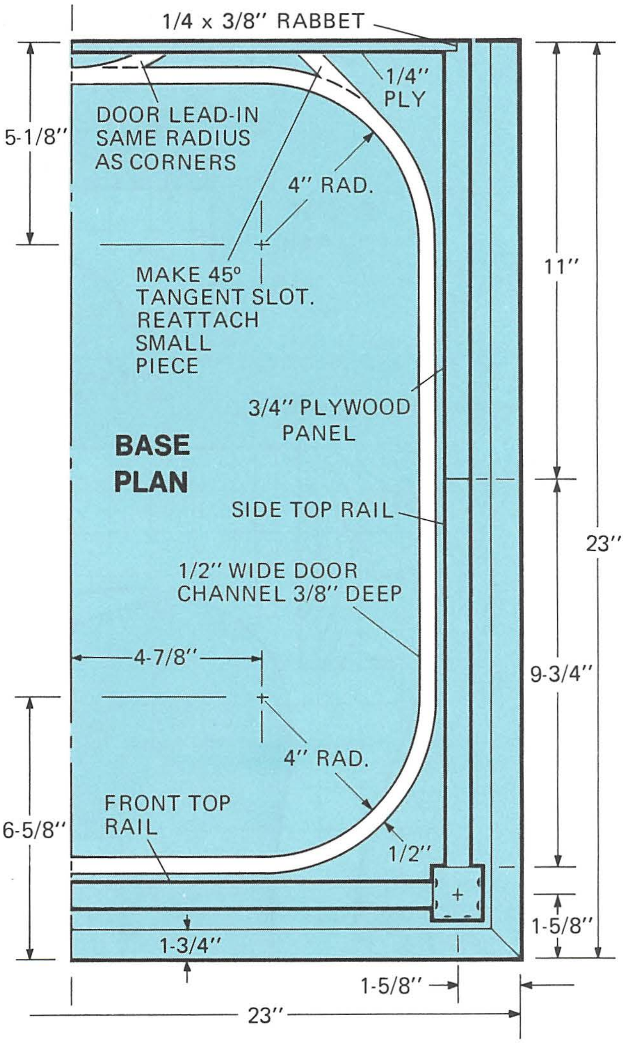
Now you can make the doors—they make the completed table stand out from run-of-the-mill furniture. With a little extra care along the way, you will be assured of a professional-looking piece of furniture. The slats are of ⁷/₁₆-in. mate-



CLAMPS ARE used in gluing the side rails to corner posts and side panels after you glue the front rail.

SLAT DOORS are inserted in track from the rear of the cabinet before the ¼-in. plywood back is installed.





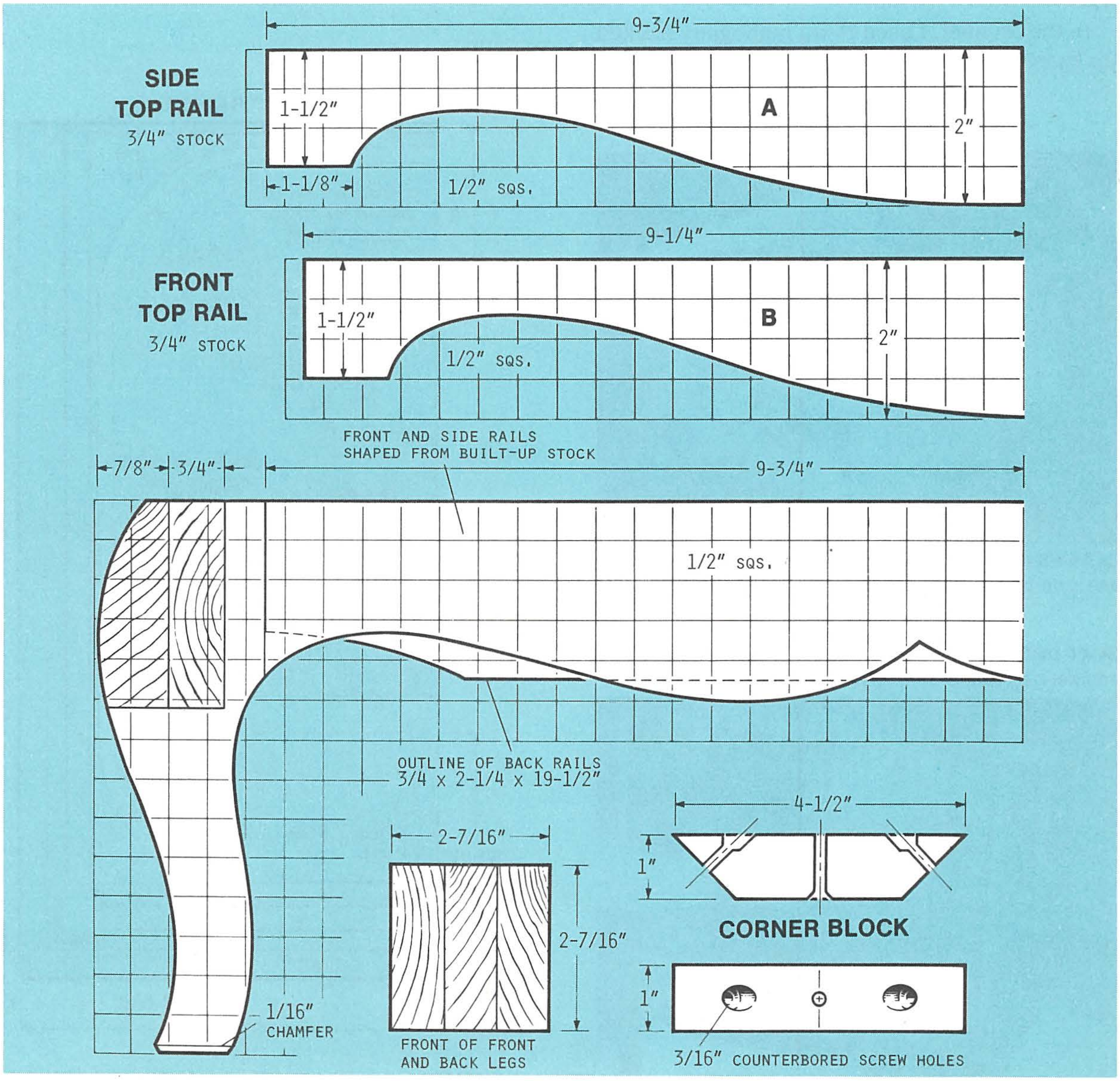
rial; 36 slats are ⅞ in. wide and two—the front ones where the knobs go—are 1¼-in. wide.

Remove the sharp edges from all pieces and sand the front faces only. There's no need to sand the backs of the slats; they're not seen because of the canvas backing. Lay all slats for one door face down on a flat piece of plywood and, using a pipe clamp, clamp them together reasonably tight. Make certain the slats are aligned and square, and clamp the ends down with C-clamps and strips of thick wood.

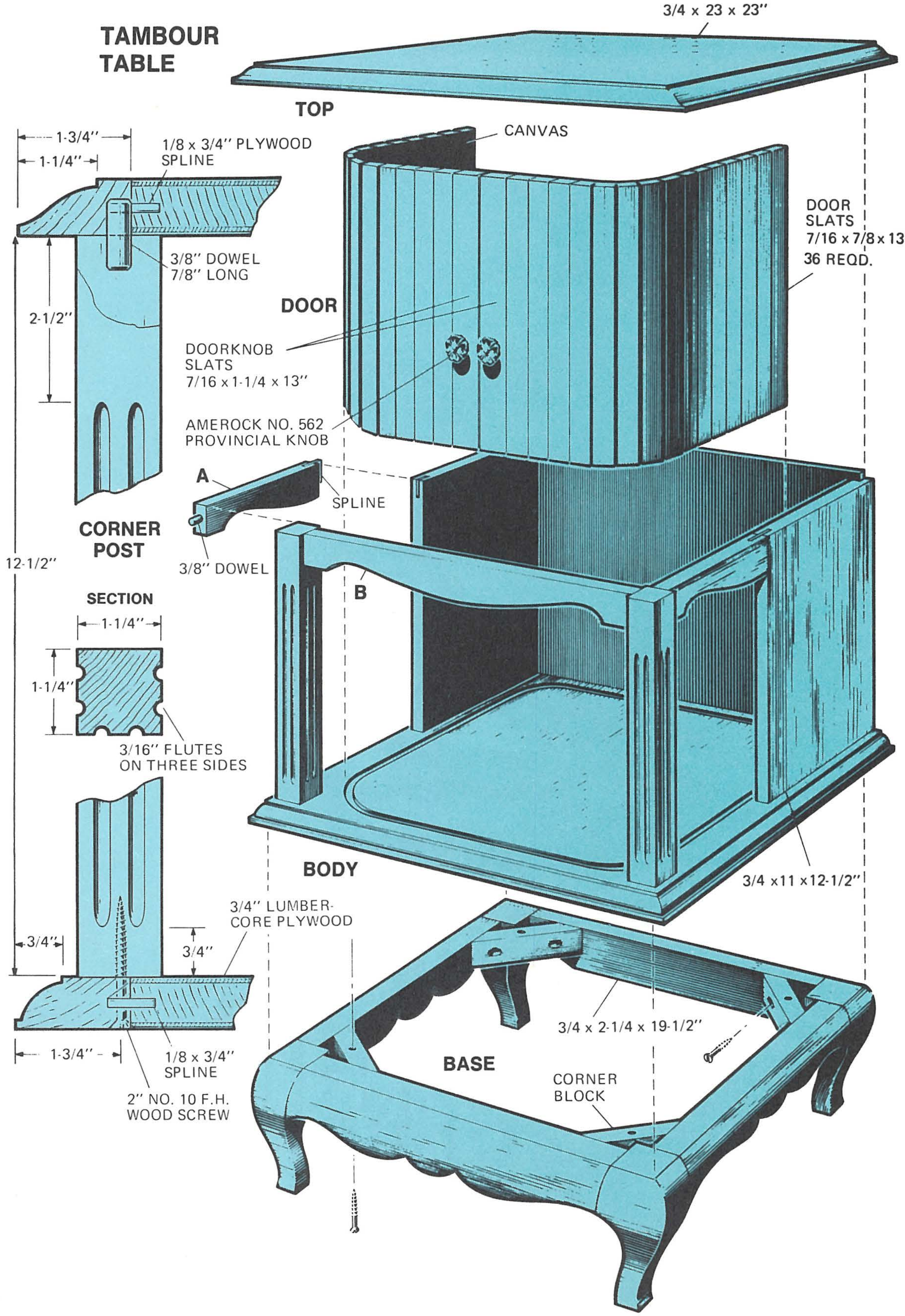
Cut two 2-in. widths of heavy canvas slightly shorter than the overall length of the clamped-up doors, apply two coats of contact cement to each slat and the canvas strip. When the cement sets, place the canvas strips in contact with the slats and smooth all wrinkles. Keep the assembly in clamps for at least 20 minutes. *Caution:* When you apply the contact cement to the backs of the slats, do not let any glue run onto the exposed sides (the cement will bleed through the lacquer finish).

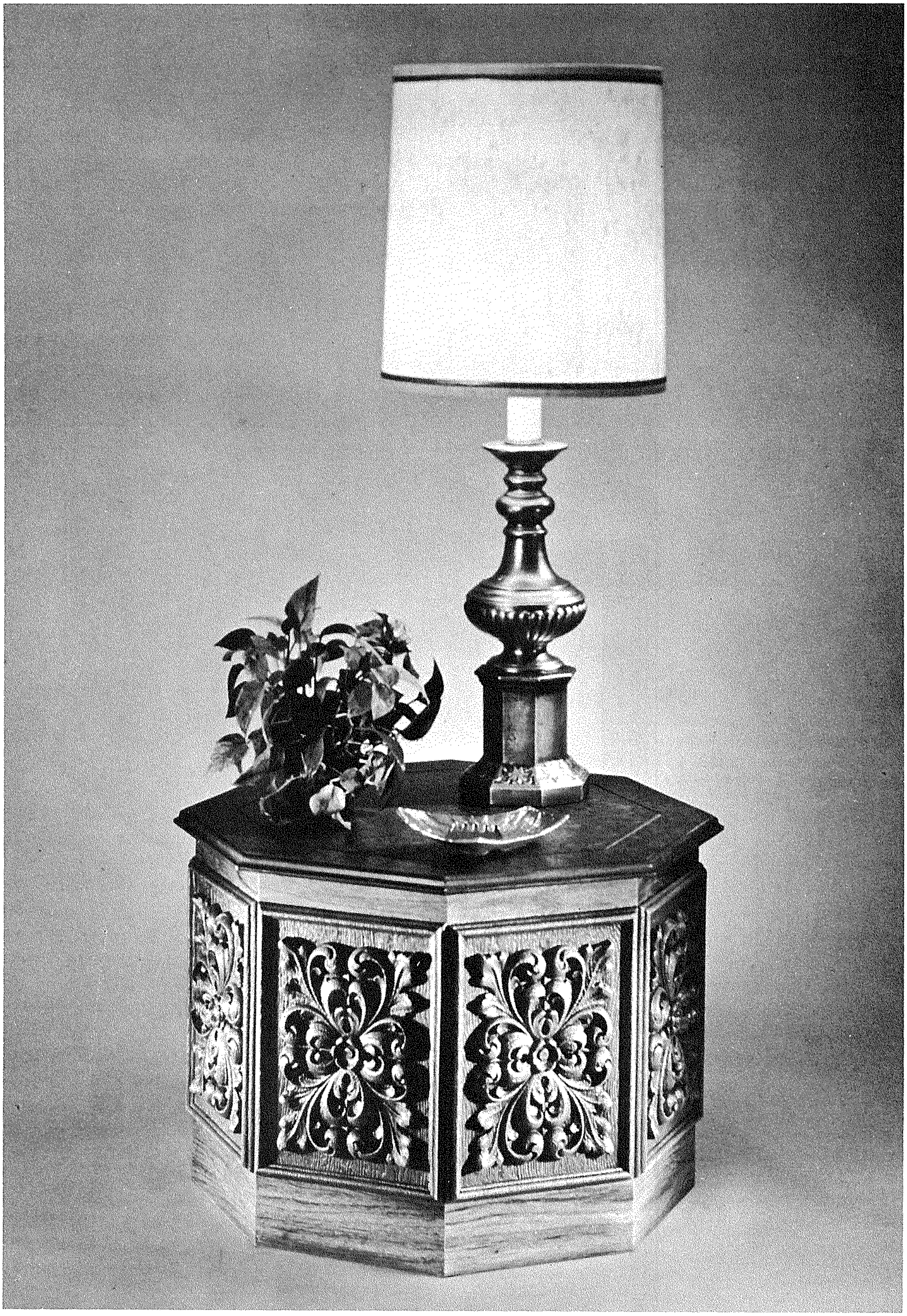
When the doors are completed, insert each one in the routed groove or track. Apply a coat of paraffin wax to the bottoms of the slats to ensure sliding ease. It's best to make a dry run of the doors with the top temporarily secured. If necessary, sand slat ends for smooth operation.

It is a good idea to stain the parts before assembly. The original tables were given a coat of sealer and three coats of satin lacquer. However, an antique-white finish with the tambour doors in mauve, makes a handsome piece. Either way, it will be one you will treasure for years to come.



TAMBOUR TABLE





Build a beautiful octagon lamp table

By WAYNE C. LECKEY

Glue low-cost panels with the hand-carved look onto the sides of this octagonal lamp table. The result will be a handsome, expensive-looking piece

■ NOTHING GIVES home-built furniture the look of elegance more quickly than molded reproductions of hand-carved panels. A good example is this handsome lamp table. Team up the panels with decorative laminate and a portable router, and this project will stack up with the best at any furniture store.

The table begins as a plain plywood shell. But when exposed plywood surfaces are covered with wood-grain decorative laminate and molded panels are added to all eight sides, your piece will look anything but homemade.

To start the octagon base, cut eight 10x20¼-in. panels from ¾-in. fir plywood, but don't bevel the edges. Next cut and cement pieces of decorative wood-grain laminate to the panels—top, bottom and center. The center piece can be scrap. Use contact cement to stick the laminate flush with the edges and run the grain crosswise.

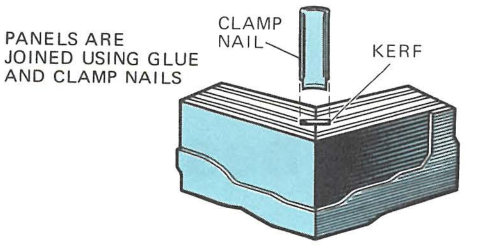
Tilt your table saw to cut a 22½° (or 67½°) angle and slowly bevel the two side edges on each panel. Use a carbide-tip blade so you won't chip the laminate. Finished width of each panel should be 9¹³⁄₁₆ in.—actual width of molded panel.

Special clamp nails, hammered into saw kerfs, are used to assemble the eight into an octagon shell. To cut kerfs in the beveled edges, return the blade to 90°, set it for a ¼-in.-deep cut and run a kerf (⅛ in. wide) full length down the center of the bevel. Hold the plywood with the bevel flat on the table and the point of the bevel against the saw fence. Clamp nails draw the joint together as they are hammered in. Apply glue to joints.

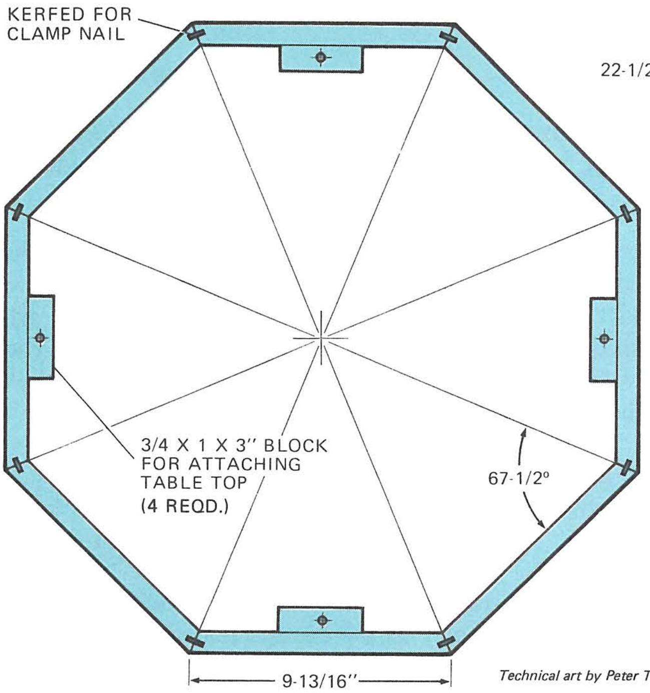
Lay out the tabletop on a piece of ¾-in. fir

SEE ALSO

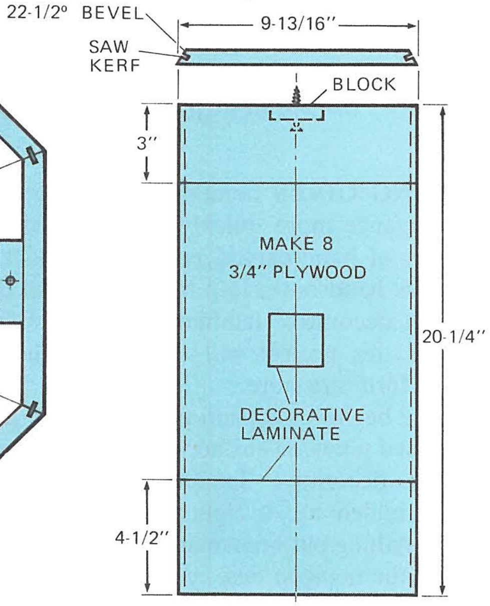
Bridge tables . . . Butcher block . . . Butler's tables . . . Coffee tables . . . Dining tables . . . Game tables . . . Hutch tables . . . Laminates, plastic . . . Twin-bed tables



TOP VIEW OF BASE



Technical art by Peter Trojan



TYPICAL SIDE PANEL
(8 REQD.)

plywood by striking a 12⅛-in. radius and drawing an octagon. Carefully miter an edging of solid wood (¾ x 1-in. walnut) and glue it to the plywood all around (see drawing, page 2123), flush with the top. The edging hides the plywood edges and provides solid stock for shaping.

To cover the top, cut decorative laminate in octagon shape roughly 25¾ in. across. When you cement it in place, keep it centered, ¼ in. in from the edge.

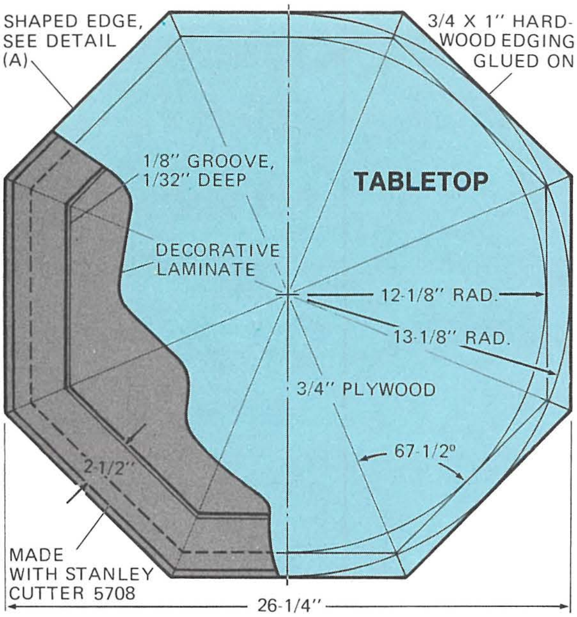
To rout the ⅛-in. decorative surface groove around the top, you'll need a jig. It's simply an octagonal ring of ¾ x 1-in. pieces made to fit the perimeter of the top. All joints of the jig are glued except one—left open (³⁄₁₆ in.) so the jig can be pulled with a C-clamp to hold it in place. Here a couple of ears (wood blocks) glued to each side of the open joint will accommodate the clamp. Notice that the jig is positioned to project ¼ in. above the top to provide a lip for the router base. The groove is made with a ⅛-in. veining bit set to just barely cut into the laminate—not more than half its thickness. Distance of the groove from the edge is determined by the router's base diameter. If it's 5 in., the groove would be 2½ in. from the edge.

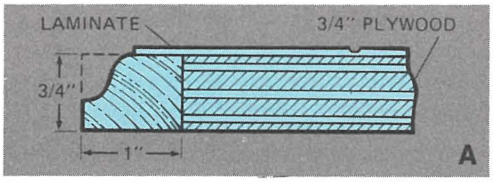
Shaping the outer edge completes the top. The original was shaped with a Stanley No. 5708 cutter. In detail A the thickness of the laminate provides the ¹⁄₁₆-in. shoulder of the profile. Take about three passes to shape the complete profile and move the router slowly, particularly when you start cutting into the laminate. Carefully hand-sand the edge.

Carved panels are glued in place one at a time with contact cement. Apply the cement to the very edge of each panel, top and bottom, and decorative laminate (none along side edges of the molded panels). Also apply cement to the center panels and laminate scraps. The first panel must be positioned squarely if the final one is to align properly with the rest. It's wise to make a dry run by fastening all eight panels in place with tabs of masking tape. Then apply guide placement strips of masking tape to the laminate along the top and bottom edges to be assured of perfect alignment of all eight. If the plywood panels of the shell were cut and joined accurately, the carved panels should fit with no space showing between abutting edges. If you wish, the plywood can be stained dark along the joints before the panels are cemented in place.

The top is attached to the base with screws through four wood blocks glued to the base on the inside at the top.

We used Johns-Manville Melamite laminate



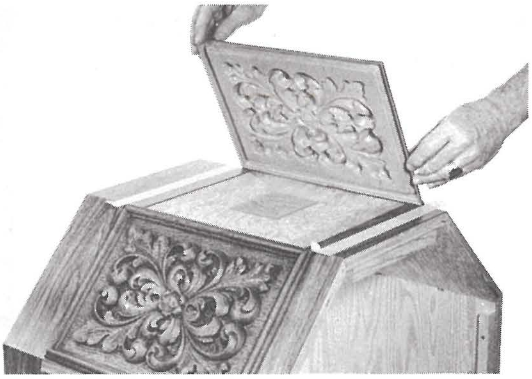


to cover the table: Carpathian burl on top, and ranch pecan on the sides. The eight carved panels can be purchased from United Southern Associates. Write them at Box 5521, High Point, NC 26262. To get the right color, ask for panel number KR-50070.

The only part that needs hand finishing is the shaped edge. After sanding it smooth, apply walnut stain and let dry. Then apply two coats of Pierce-Stevens Wood Lore or Gaston's waxing lacquer, sanding lightly between coats. Finally, apply stain only to the ⅛-in. groove in the top with a small brush.

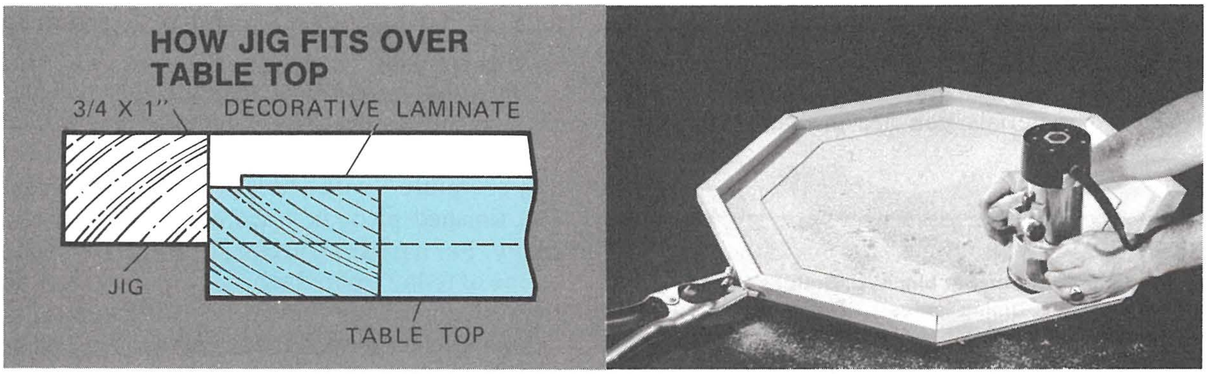
A BAND OF contact cement goes on the laminate along the edge of the masking tape. Use a small brush.

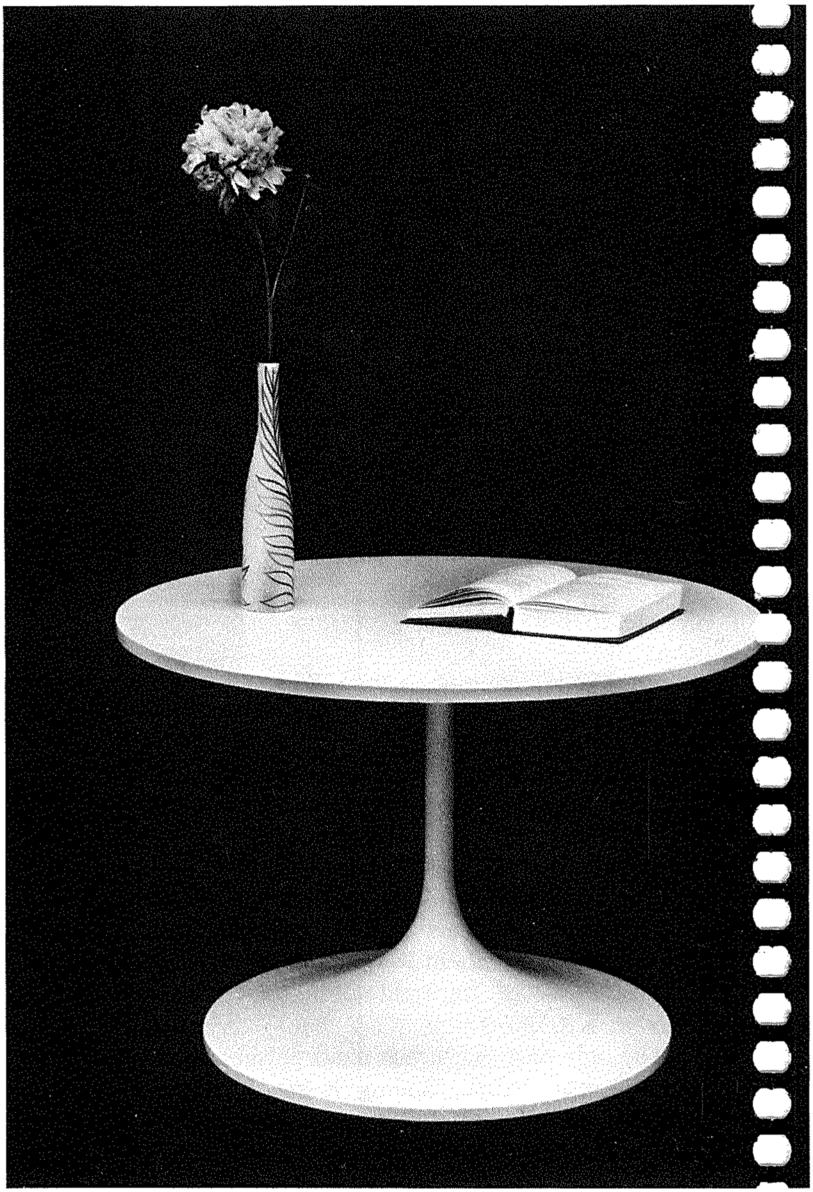
CONTACT CEMENT is also applied to the back of each carved panel, at the top, bottom and center.



POSITION THE panels after the cement is dry to the touch. That takes 20 minutes or so.

A WOOD RING clamped to the perimeter makes a fence to guide your router as it makes a ⅛-in. decorative groove.





A contemporary pedestal table

By JACKSON HAND

Here's a table you can make with a new and interesting technique. The construction method can be applied to other types of modern furniture for your home

▨ YOU'VE SEEN gracefully formed pedestal tables such as this in decorators' magazines, smart boutique shops and fine-furniture store windows. And just as likely, you've gulped at the prices they sell for.

Happily, you can duplicate this table with tools and materials you are probably already familiar with by utilizing a new technique. You can make it for the price of a sheet of plywood, a short piece of pipe and two flanges, a few packages of vinyl patching plaster, paint, some screws and glue.

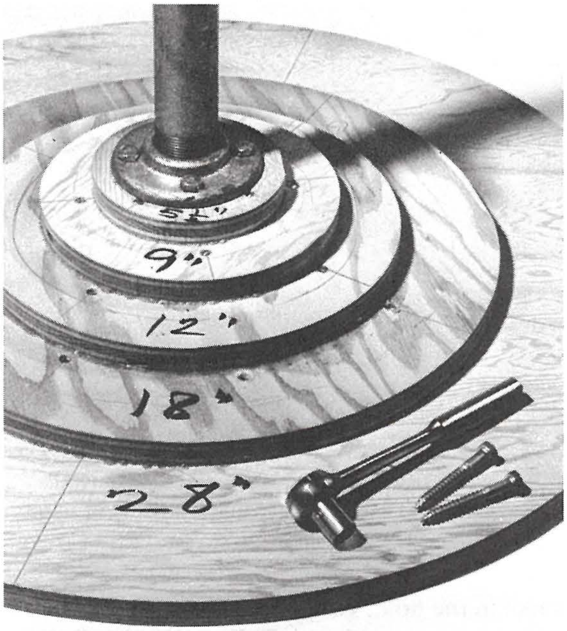
The sculpting involved is simple, yet challenging and interesting. The technique is a sort of cross between using a potter's wheel and doing clay sculpture—with a little spackling thrown in. The finished piece is graceful, but rugged and heavy. For a finish, you can paint it white, black or one of today's popular bright colors to suit the room decor. And the same construction techniques can be used to build such items as stands for TV, hi-fi speakers and the like.

SEE ALSO
Bridge tables . . . Butcher block . . . Butler's tables . . . Coffee tables . . . Dining tables . . . Game tables . . . Hutch tables . . . Party tables . . . Plaster casting . . . Twin-bed tables

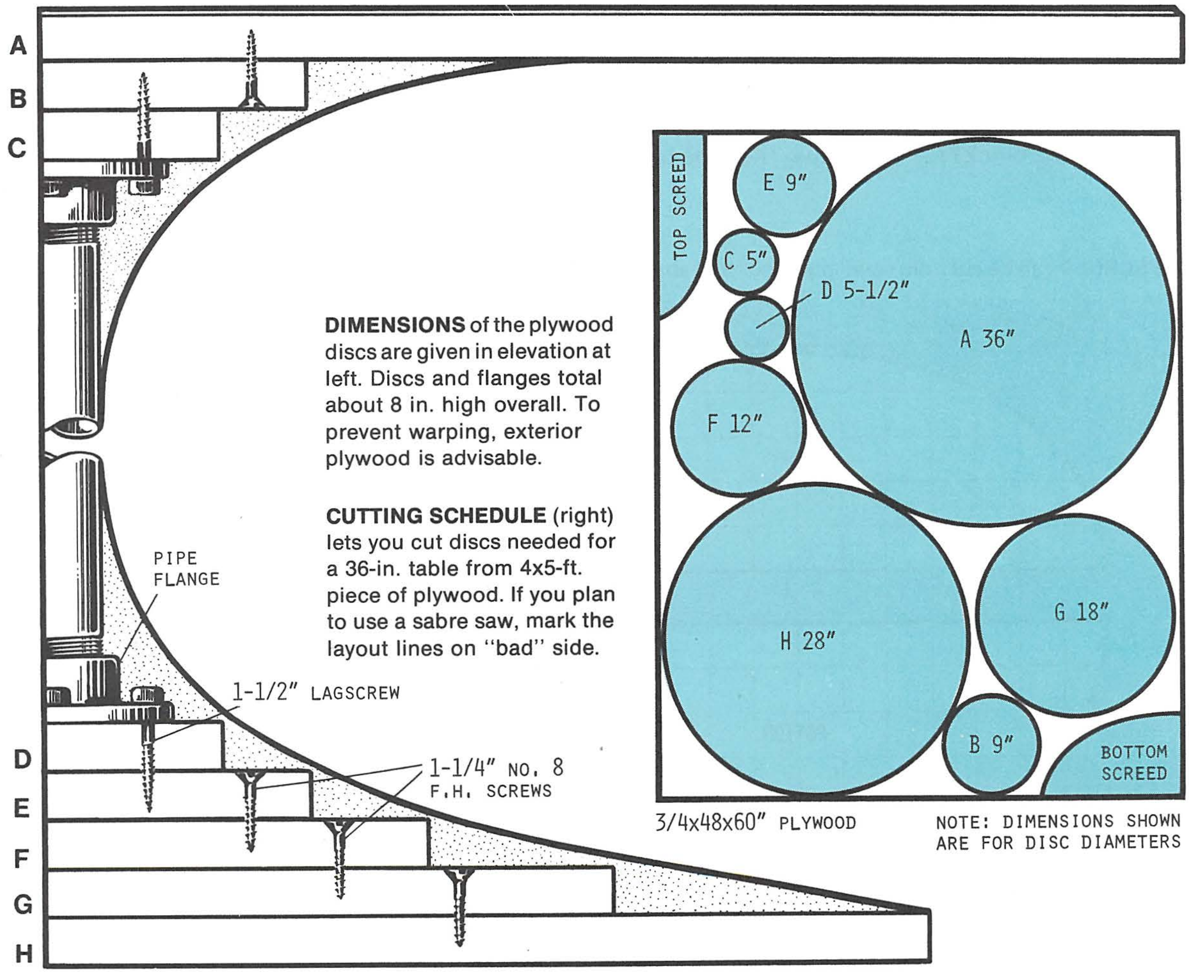
The dimensions for the table shown are entirely arbitrary; the piece was made to be used as a fairly large occasional table. You can make it, of course, any size you wish; in practice, you're limited only by the standard 48-in. width of a plywood sheet.

The basic skeleton of the table is a pair of built-up plywood discs—one for the top, one for the base. The stem is a length of 1½-in. galvanized pipe fastened to the top and the base with pipe flanges and lagscrews. All of the parts are then given shape with a patching plaster such as Savogran Crack Filler or Durham's Rockhard Putty. Drill a small hole through the center of each disc to form the pilot-point for penciling the circle. These holes also let you slip a nail through the plywood discs to insure accurate centering when assembling.

To assemble the discs, spread glue evenly on the first disc, center the next smaller size and put



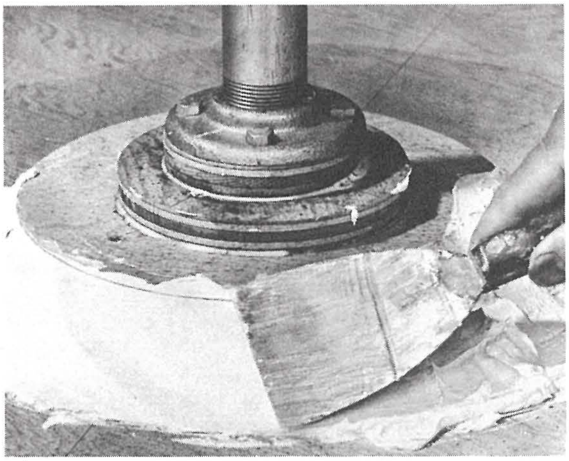
THE PEDESTAL BASE is formed of glued-together plywood discs. Pipe determines the table height.



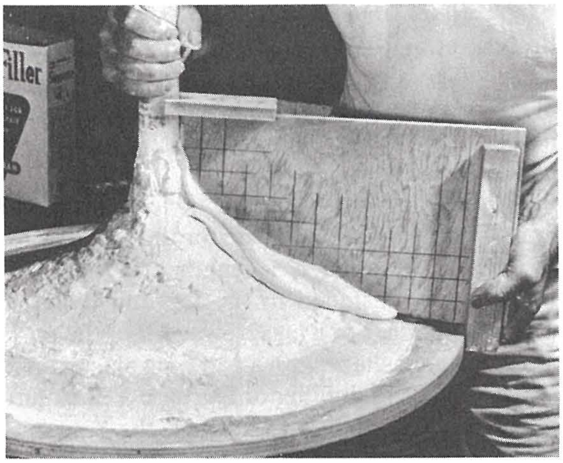
THE FINAL HEIGHT of the table on the opposite page (in which a 16-in. pipe was used) is about 24 in. If you decide to increase the table's height, increase pedestal and top circumferences in direct proportion.

DIMENSIONS of the plywood discs are given in elevation at left. Discs and flanges total about 8 in. high overall. To prevent warping, exterior plywood is advisable.

CUTTING SCHEDULE (right) lets you cut discs needed for a 36-in. table from 4x5-ft. piece of plywood. If you plan to use a sabre saw, mark the layout lines on "bad" side.



THE FIRST STEP in molding the gracefully curved pedestal is to fill in the "steps" using plaster of paris.



THE FINAL SHAPE is made by screeding patching plaster with a special plywood screed built as shown.

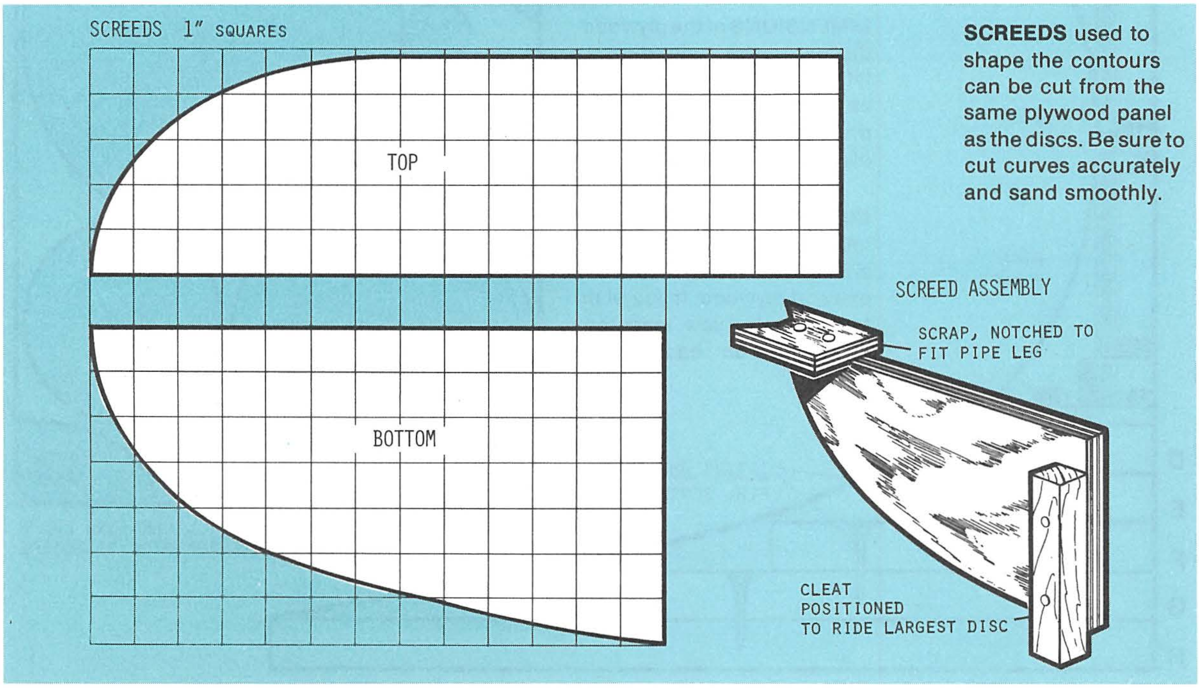
a nail in the hole. Drive the 1¼-in. No. 8 screws and move on to the next disc. When all discs assembled, center the two pipe flanges and fasten in place with lagscrews.

You can save time and money by using ordinary plaster of paris for the initial filling. It's best to apply the plaster in two or three coats, starting with a thick mixture and ending with a mixture the consistency of heavy cream. Glob on a trowel-full and screed the shape by holding the tool (notched block) firmly against the pipe and the cleat against the plywood edge. You'll end up with the shapes quite true, but *not* entirely smooth. Do the final smoothing by laying on joint compound the same way you do when finishing a plasterboard wall.

When the plaster is dry, apply several coats of flat enamel, sanding thoroughly between coats.

If you prefer a durable top for use as a work surface, plastic laminate is a practical choice. In this case, apply a laminate self-edge strip to the plywood edge before laminating the top.

THE SCREED can be cut from scrap plywood lying about the shop. The notched block guides it around the pipe.



SCREEDS 1" SQUARES
TOP
BOTTOM
SCREED ASSEMBLY
SCRAP, NOTCHED TO FIT PIPE LEG
CLEAT POSITIONED TO RIDE LARGEST DISC

SCREEDS used to shape the contours can be cut from the same plywood panel as the discs. Be sure to cut curves accurately and sand smoothly.

A service manual for your outboard motor

By MORT SCHULTZ

This article is divided into five sections that correspond to the five major systems of your outboard motor: (1) ignition; (2) starting; (3) fuel; (4) powerhead; (5) lower unit. It is a comprehensive discussion, carefully arranged in step-by-step fashion, that will permit you to make both minor and major repairs on your motor

1. The Ignition System

THE CONVENTIONAL, non-electronic ignition system of every one and two-cylinder outboard engine consists of a magneto, sparkplugs and high-tension cables.

The heart of this system is a magneto (Photo 1). They're all pretty much the same—if you can repair one, you can repair all. You'll need two pieces of equipment—a flywheel puller and a magneto analyzer.

You can get both from a dealer of outboard equipment. Be sure the magneto tester is accompanied by an instruction book.

Keep in mind that all components of the ignition system should be tested once you pull the flywheel, even though you may find and replace a bad part at the start of your checks. New breaker points, for instance, may increase the spark. But if a weak condenser (that caused failure of the points in the first place) goes undetected, the trouble will soon reappear.

Ignitions of two-cylinder engines have two of everything: plugs, points condensers, coils. In one-cylinder engines there's one of each.

How do you know when your outboard ignition system is giving trouble? If the engine refuses to start or is hard to start, pull a sparkplug after cranking the engine to see if fuel is getting to the cylinders. If the plug is wet, but the motor isn't starting, the trouble is undoubtedly ignition. Occasionally, an engine that misses at high speed or won't get up to full speed signifies an ignition breakdown.

You can check for ignition trouble another, more positive, way. Remove a sparkplug lead and hold it ¼-½ in. away from a ground on the engine block. Crank the motor. A spark should jump the gap.

Another way to test for spark is to start the engine and pull a lead from a plug. Hold it ¼ to ½ in. away from the plug terminal to see if a spark jumps the gap. Be careful if you do it this way. Make the test for just an instant. It puts a strain on the coils and might cause a good coil to break down.

Caution: To avoid the possibility of a shock when holding a sparkplug lead to ground or a plug terminal, grasp the lead with insulated pliers.

Sparkplugs, loose or shorted wiring, and breaker points account for practically all ignition failure. Occasionally, a condenser or coil will go bad. Rarely, if ever, do the magnets in the flywheel give trouble.

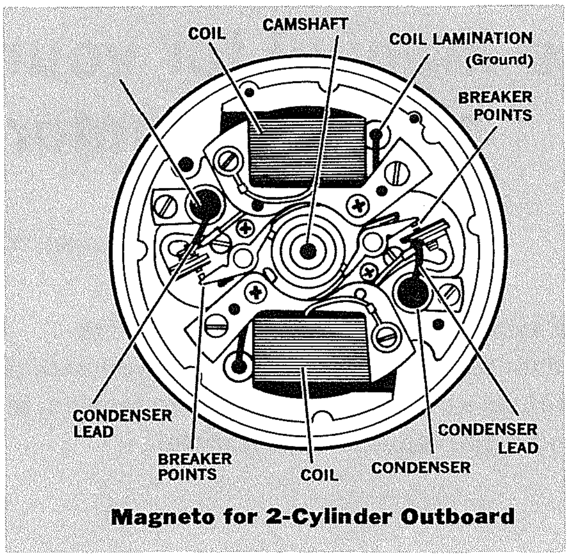
What follows is how to test, replace and adjust each ignition component. Keep in mind that the specifications we give are general; that is, they apply to most model outboards 1965 and later that possess conventional magneto ignition systems. However, it's advisable to get the exact specifications for your engine from a dealer or from the manufacturer.

sparkplug testing

Start with sparkplugs. If you find them the reason for your ignition failure, you don't have to go further. Look for dirty plugs, improper electrode gap, worn electrodes, broken or cracked insulator and plugs of the wrong heat range.

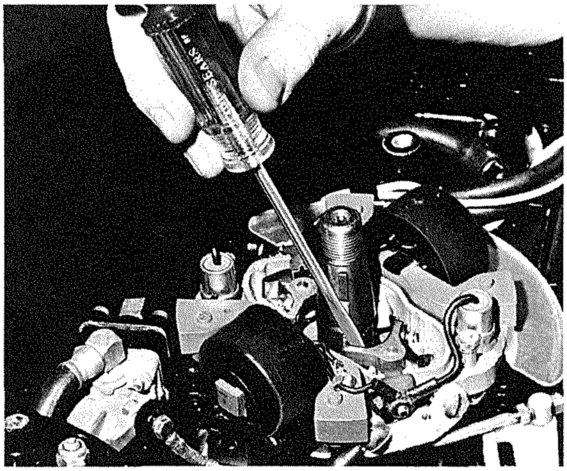
SEE ALSO
Batteries, boat . . . Boat repair . . . Boat testing . . . Boating . . . Boats . . . Compasses, marine . . . Pontoon boats . . . Propellers, boat

IGNITION SYSTEM



Magneto for 2-Cylinder Outboard

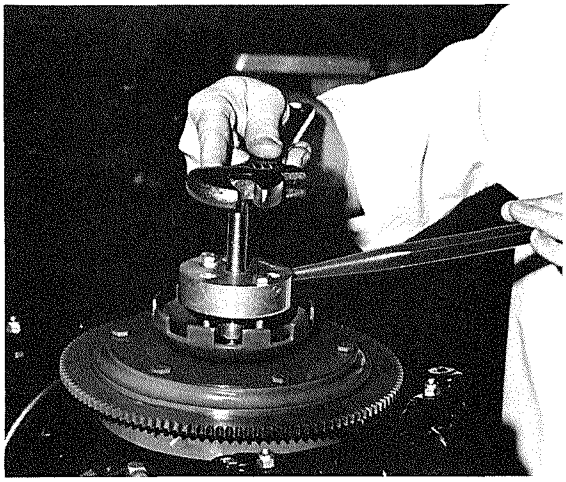
1. MAGNETOS are all about the same, except that one for a 2-cylinder engine has two of everything, one for a 1-cylinder engine just one of each part.



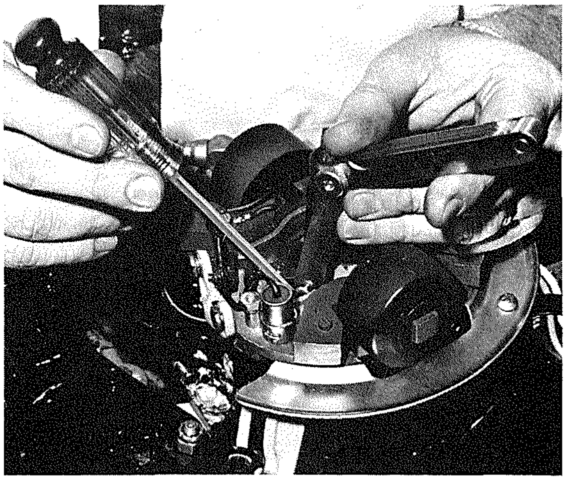
5. BREAKER-POINT spring tension should be 33 to 37 lbs. Replace if point tension is not firm to touch.

Heat range is important. If the plug insulator tips are blistered, indicating that the plugs have been running hot, switch to the next colder plug. If they are fouled, indicating improper combustion, they are running too cold, so switch to the next hotter plug.

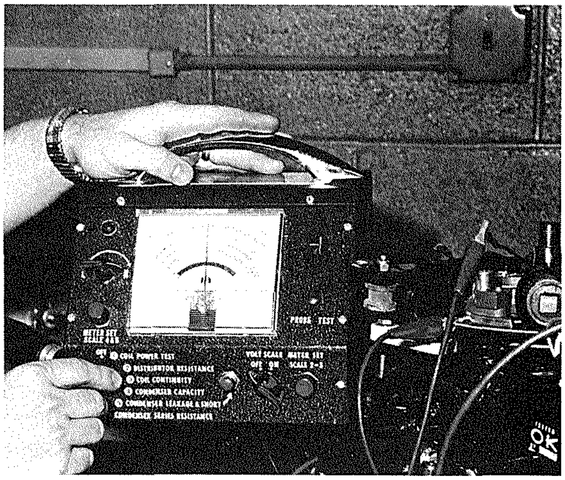
Replace damaged plugs, and those that have a ground electrode worn to $^1/_{16}$-in. below the edge of the shell. Clean dirty electrodes with a strip of emery cloth and check gap. The usual sparkplug gap for OMC and Chrysler engines is 0.030 in. Plugs in most Mercury engines are gapped to



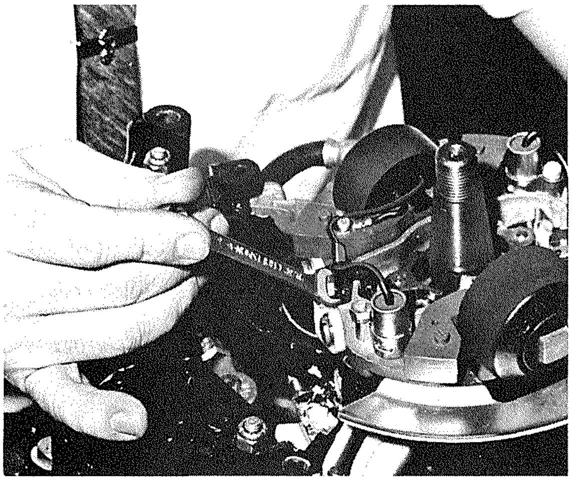
2. WITH FLYWHEEL NUT and attaching screws removed, use puller to remove flywheel. This uncovers magneto.



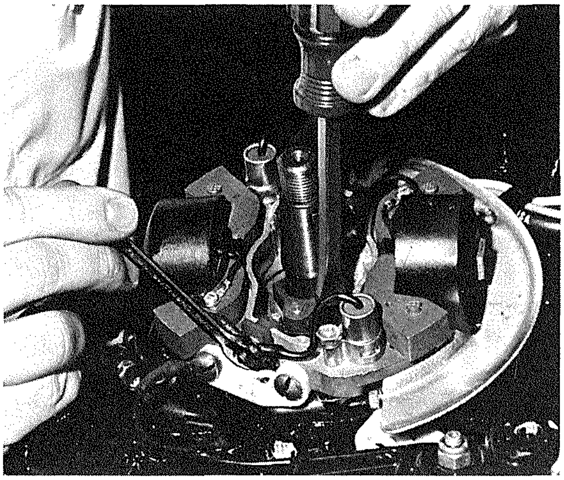
6. WHEN ADJUSTING POINTS, the important thing to remember is that the breaker arm must be on the high lobe of the cam so the points are fully open.



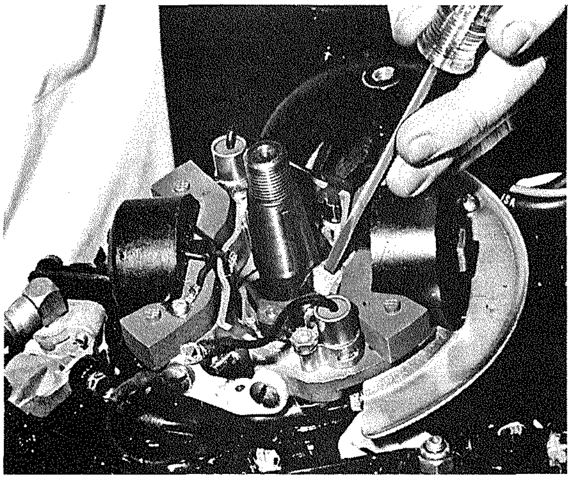
9. TO TEST COIL, use the magneto analyzer book to find the correct way to make the right hookup and to set the meter for a coil check.



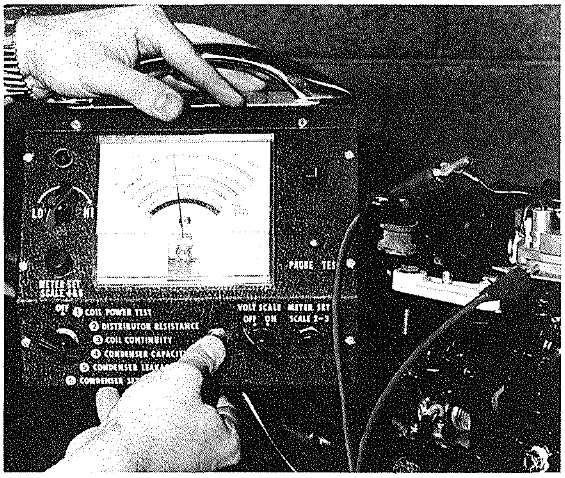
3. TIGHT CONNECTIONS are a must. A critical one is where condenser lead joins coil primary leads.



4. REPLACE BREAKER POINTS by disconnecting the condenser lead, unscrewing points. Parts lift out.

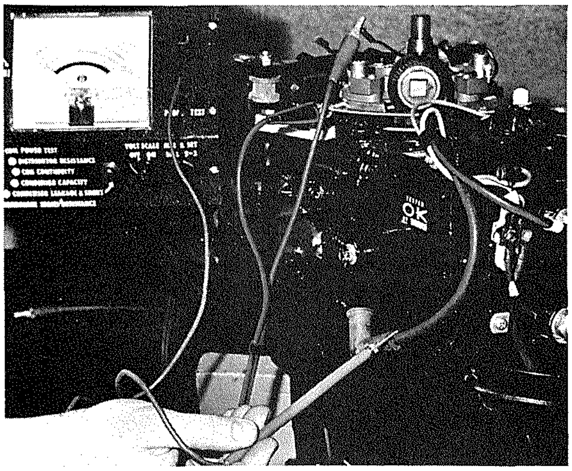


7. CAM LUBRICATOR WICK is shown here. It's good for about 100 hours of operation. You should replace the wick when you replace the breaker points.

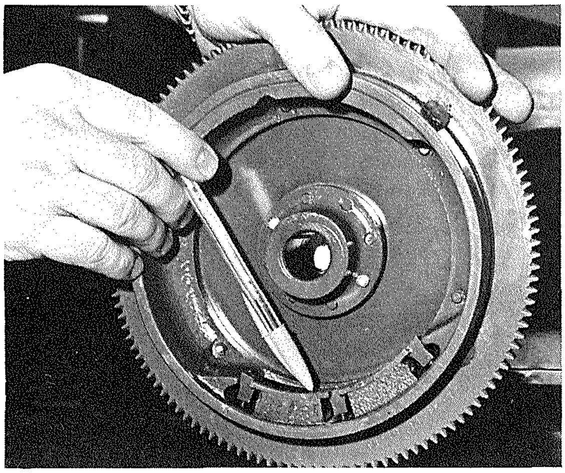


8. WITHOUT A MAGNETO ANALYZER to check motor properly, you can merely replace different parts. Condenser capacity here shows 0.17 mfd.

continued →



10. WITH A LEAKING HIGH-TENSION LEAD, you'll get a flash between the lead and the meter test probe. If there's a flash, replace the leads.



11. MAGNETS IN THE MAGNETO should hold up for the life of the outboard. But should a sharp blow damage them, you will have to replace the flywheel.

0.025 in. Those in McCulloch outboards are gapped to 0.035 in. *Important:* To adjust gap, bend the side electrode only.

In replacing plugs, torque to 20 ft.-lbs. A loose plug will cause loss of compression; a tight plug will overheat.

Give sparkplug cables a close inspection. Replace if cracked or split, and check boots, too. Discard if damaged. You will give each high-tension lead a closer test for leakage when you test the coils later.

removing the flywheel

If sparkplugs are not the cause of trouble, you must now remove the flywheel to investigate further. All flywheels are removed in much the same way. Unscrew the flywheel nut and screws (usually two or three) holding the flywheel to the magneto armature plate. To remove the flywheel nut, you have to hold the flywheel steady. This can be done with a strap wrench. Using the flywheel puller, remove the flywheel from the crankshaft (Photo 2).

(Remember that when you reinstall the flywheel it is important that the nut be torqued to proper specifications. This spec is normally 40 to 50 ft.-lbs.)

Next, check all electrical wires for tightness at connections and for frayed insulation (Photo 3). If a section of wire is bare or the insulation is worn, shorts will keep the engine from running. If the insulation isn't too badly frayed, repair it with a strip of insulating tape. If shot, replace the part. Notice that each component of the magneto—points, condensers, coils—is held by a screw or screws. Replacement is easy by removing the screw(s) and lifting the components from place (Photo 4).

Breaker points can wear, become dirty and go out of adjustment. To check them, first inspect for corrosion and wear. Test the tension of the breaker arm with your finger or a screwdriver (Photo 5). It should be firm. Replace points that are questionable.

cleaning points

Although dirty and oily points affect good performance, they can usually be salvaged by cleaning. Apply a drop of alcohol or trichlorethylene to the points and pass a strip of bias tape up and down between them. Never file points. You'll ruin a good set and make a bad set worse.

Use the magneto analyzer to test points for good electrical contact. Connect the proper test lead to the breaker-arm lead and the other test lead to ground. Consult the magneto-tester instruction book for exact details on how to use it.

Set the analyzer for the breaker point test. If the meter needle shows that point contact is poor, make sure test-lead connections are tight before rejecting the points. Tight connections are necessary for accurate test results.

The final service done to breaker points, whether new or old, is to adjust them. This is important and must be done exactly to specifications since the breaker-point gap controls the timing of the ignition by the number of degrees the points open before the piston reaches top dead center. Mercury, OMC, Chrysler and McCulloch engines generally have a breaker-point gap adjustment of 0.020 in., but it is advised that you double-check to make sure this specification is correct.

To set gap, make sure the points are *fully* open by having the breaker arm on the high lobe of the cam (Photo 6). Use a feeler gauge and adjust by loosening the breaker-arm screw and moving the points wider or closer together. When one set of points is gapped properly, rotate the crankshaft 180° clockwise to open the other set. Repeat the procedure.

Every magneto has a wick for lubricating the cam. No additional lubricant should ever be added. A new cam wick is usually supplied with new breaker points and should be installed when points are changed (Photo 7).

testing condensers

Condensers may look discolored. Don't worry about that. Discoloration doesn't affect condenser functioning.

Each condenser is tested for leakage, capacity and resistance. Leakage must be more than one megohm, but the capacity depends on the condenser. Most are rated from 0.17 to 0.22 microfarads (mfd.). However, some have different values. For example, some Mercury engines use condensers that have an mfd. capacity of 0.15 to 0.19 and 0.22 to 0.27. Check with a dealer or the manufacturer of your engine.

To test a condenser, disconnect the condenser lead to the breaker point assembly. Connect one test lead of the magneto analyzer to this pigtail and the other test lead to ground. Check the condenser for each of the parameters mentioned above by switching from one to the other on your analyzer (Photo 8).

Be careful during the leakage test. High voltage is being applied to the condenser by the analyzer. Don't handle test leads. Before disconnecting the leads from the condenser, be sure the turn selector switch of the analyzer is off.

handling coils

In newer outboard engines, a coil that's removed from the magneto and then reinstalled can go on in only one way—the right way. This is not true of all magnetos, however. In some, a correct airspace has to be left between a coil and its core.

To be on the safe side, if you have to remove a coil, first measure exactly the distance between the face of the coil and the edge of the coil seat. When putting the coil back in place, set it to this specification. Do not tamper with the core.

When connected to the magneto condenser, the coil is tested under actual operating conditions. The analyzer provides an interrupted primary current and measures the induced secondary voltage. If the coil's okay, the meter will show it.

Test leads from the magneto analyzer are connected to ground, to the coil primary and to the secondary (Photo 9). Adjust the meter as specified in the instruction book. Note the meter reading.

A low reading means that the coil is weak and must be replaced. You can get a higher reading by increasing primary current, but this is false. The coil is shot if it won't come up to spec with the primary current that's specified in the instruction book.

Now, check the coil for leakage by running a test probe over the housing. Replace any coil that's leaking.

checking plug leads

To test a sparkplug high-tension lead with its respective coil, disconnect the meter lead that runs to the secondary. Leave the other leads in place and probe the entire surface of the sparkplug lead (Photo 10). If insulation has broken down, you'll get flashover. Replace the lead.

Magnets are located in the flywheel (Photo 11). They could be damaged by a hammer blow or a dropped flywheel, so be careful. Before replacing the flywheel, use mineral spirits to clean magnets of foreign matter that could hamper their function.

The importance of periodic inspection of sparkplugs, followed by cleaning or replacement, cannot be overemphasized in your preventive maintenance of an outboard ignition system. Dirty or worn plugs are the major cause of ignition failure.

When installing new plugs, be sure gaskets are replaced. Start the plug into the cylinder with your fingers to avoid cross-threading. Run them up finger-tight and torque to 20 ft.-lbs.

If your outboard motor is equipped with an electronic ignition system, you can confine your activities to inspecting and, if necessary, replacing sparkplugs and inspecting sparkplug leads. In the event of a problem that suggests ignition-system failure (see above), the outboard should be referred to a factory-trained service technician. Luckily, electronic ignition system failure is not a common occurrence.

2. The Starting System

■ OUTBOARD MOTORS have manual starters or electric starters, or both. We'll explain how to repair a manual starter first; then we'll talk about electrics.

Most outboard motors employ a manual starter of the type similar to that shown in Photo 12.

Manual starters are extremely reliable. Most will last the life of an outboard motor if treated properly. The commonest problem is a damaged rewind spring. This happens most often when the operator steps back and gives the rope a yank that exceeds its length. It's also possible for the rope to break, but this isn't as common as some people believe. Starter ropes are exceedingly strong.

You'll need a spring rewind tool to repair a manual starter. You'll also need a rope-threading tool to pull the rope through the handle.

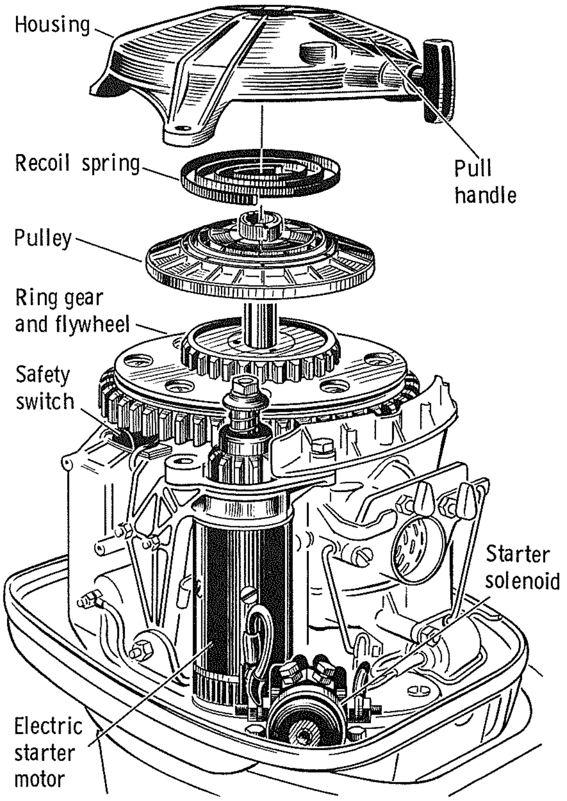
You must be very careful in handling manual starter repairs. The rewind spring is under great tension and could cause serious injury if allowed to fly loose. Wear safety glasses. Also make sure you hold the starter housing and pulley parts firmly together once the connecting spindle has been removed. This will prevent the rewind spring from slipping loose.

repair steps

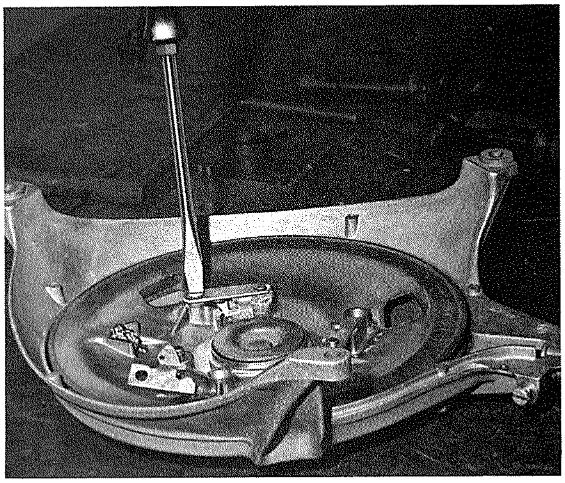
Here is how to repair a manual starter:

1. Remove the attaching screws holding the starter housing to the powerhead and lift the housing from place.
2. Remove the pawl retainers, pawls, spindle, and friction ring (Photos 13 and 14). Examine the pawls. If worn, replace. Note how parts come out of the housing so that replacement will be simplified.

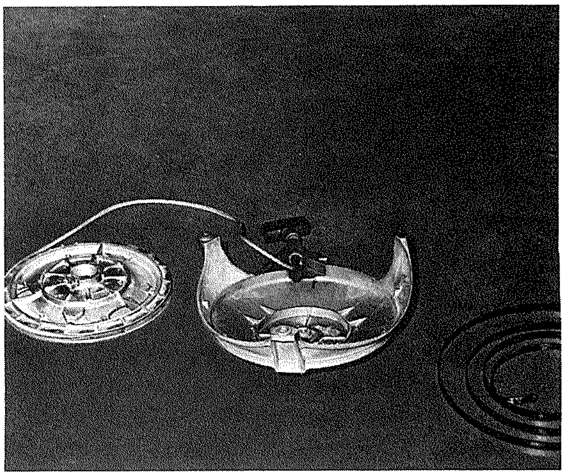
STARTING SYSTEMS



12. UPPER THREE PARTS are used in manual-start systems, the lower parts in electric-start systems.



13. REMOVE PAWLS from starter housing (some are shown in lower part of housing). Check them for wear.



16. THE THREE manual-start parts can be worked on. If there's an "S" in spring, untwist and reuse.

3. Now, drop the starter, bottom side down, on the floor (Photo 15). This will separate the housing, pulley and spring (Photo 16).

4. If it isn't broken, pull the starter rope out far enough for you to tie a slipknot. Then pry open the rope anchor and remove the rope.

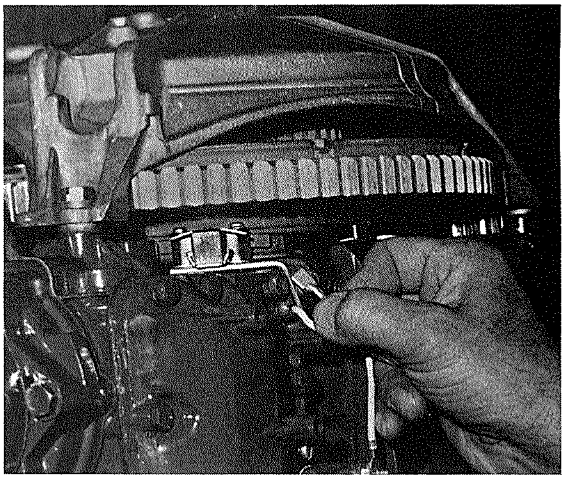
5. Spread some Type A lubricant on the end of the rope to allow easy removal of the handle.

6. Replace a damaged starter rope or rewind spring.

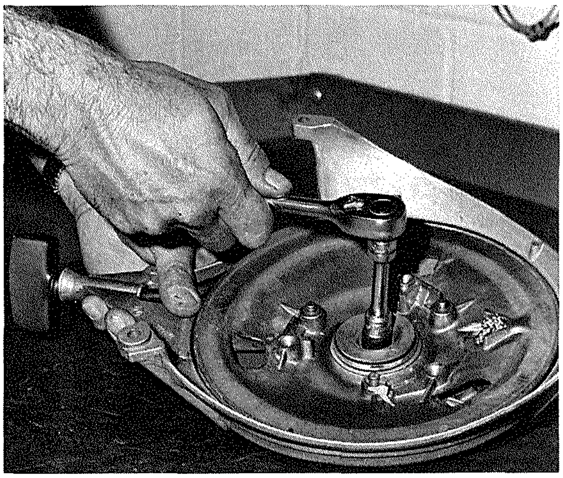
7. To put the starter back together, insert the base plate of the rewind tool into a vise. Place the starter pulley in position on the base plate, making sure that the center pin fits into the center loop of the spring. Insert the tool's bushing and handle into the pulley and base plate, and crank up the rewind spring (Photo 17).

8. When the spring is tight, release it slowly until you're able to slide the dowel pin through the hole in the pulley and into the spring loop. This pin holds the spring in place while you reassemble the starter.

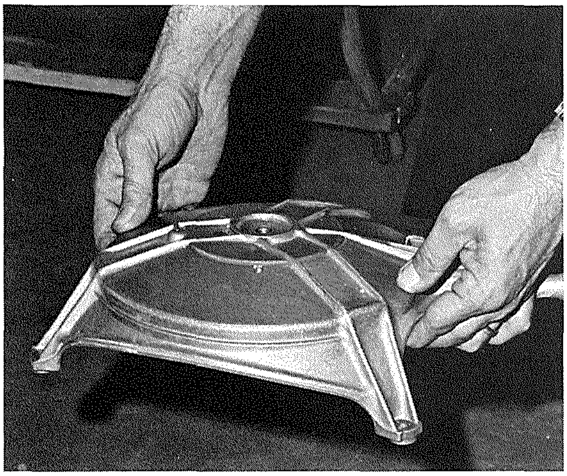
9. Lubricate the spring with some Type A grease and place the pulley and spring into the



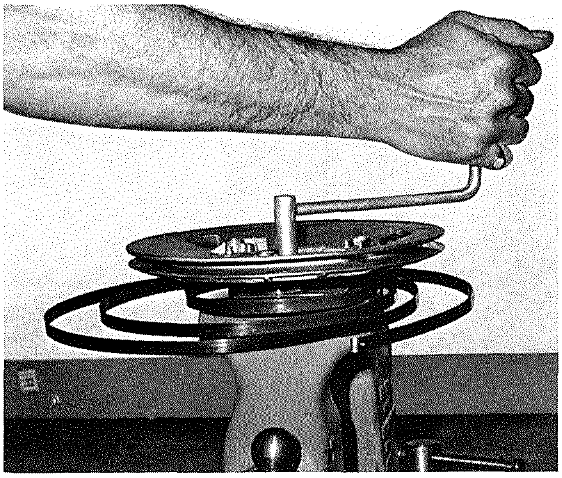
19. GROUNDING safety-switch wire should make motor operate. If not, the switch could be bad.



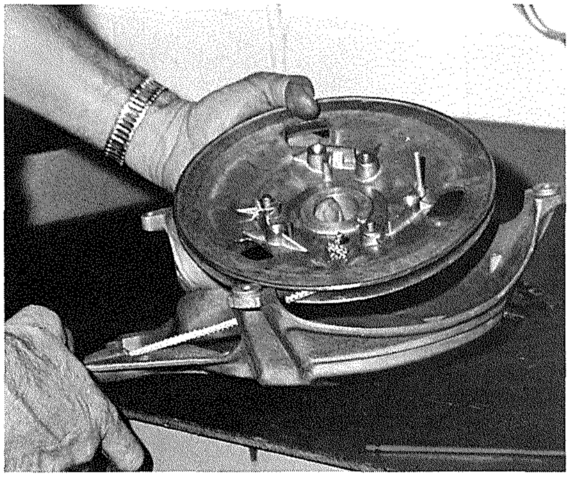
14. REMOVE SPINDLE from housing. Hold housing and pulley together until ready to separate the two.



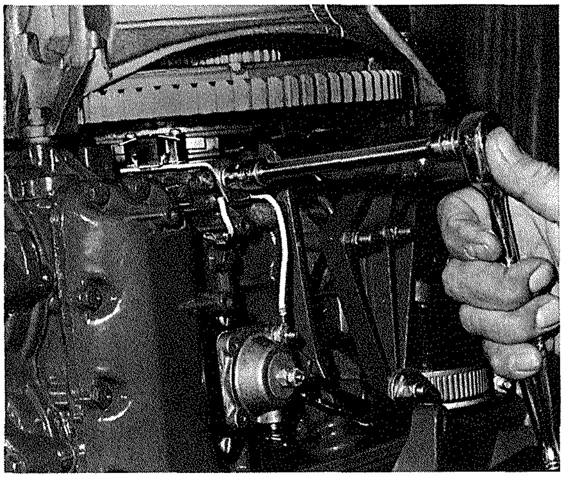
15. DROP ASSEMBLY. Step back quickly to avoid being struck by rewind spring located in assembly.



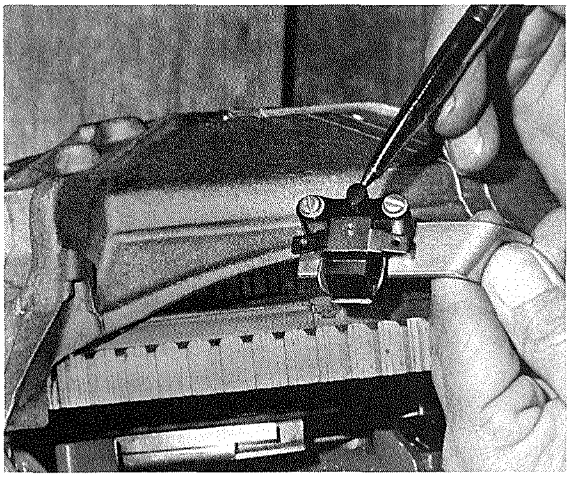
17. REWIND TOOL is needed to reassemble spring into pulley. Crank until spring is tight. Insert dowel.



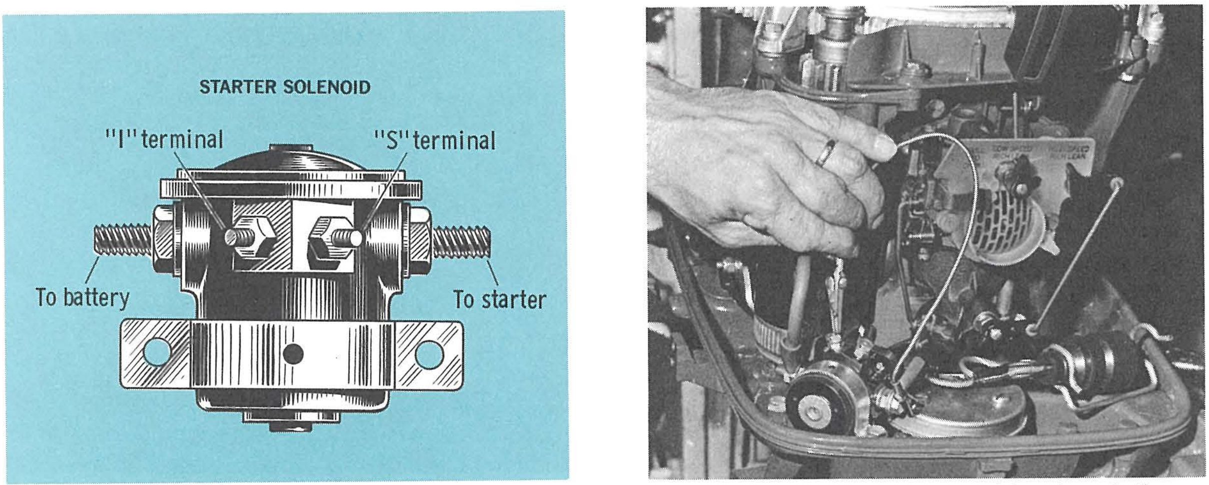
18. DOWEL PIN, inserted in pulley, holds spring in place until pulley is fitted into starter housing.



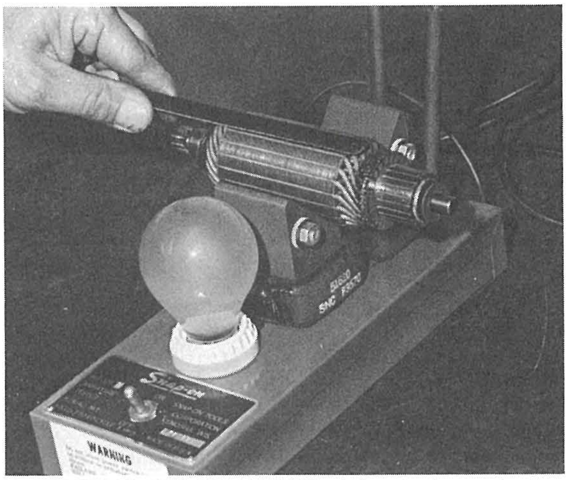
20. THE SAFETY SWITCH is usually held in place by one bolt. This is easy to remove and to replace.



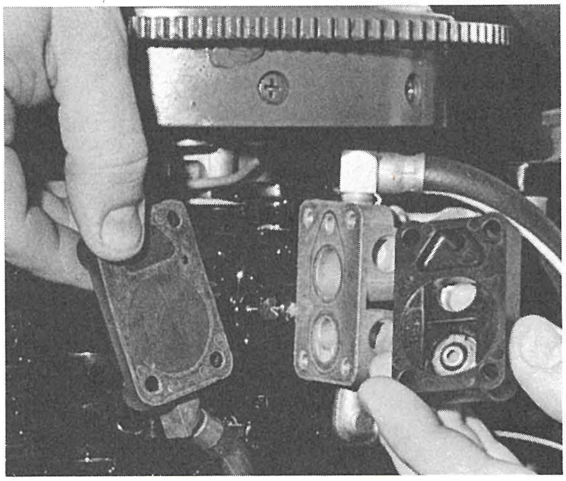
21. THE PLUNGER of the safety switch is so positioned that it actually rides on cam seen at lower left.



22. STARTER SOLENOID (above) is the key to the electric-start system. Jumper wires (right) connected to the solenoid terminals help you to determine whether or not the solenoid is in good condition.



23. TURNING THE ARMATURE of the starter motor in growler is the best way to check for malfunctions.



24. FUEL PUMP consists of diaphragm (left) and booster chambers (right). Replace a worn diaphragm.

starter housing, making sure that the outside spring loop is on top of its stud in the housing (Photo 18). Press down so the stud forces the dowel pin out.

10. Tie a slipknot into the rope to keep it from winding up. Now, reassemble the starter.

11. A tough job is usually that of putting the handle back on the rope. If the rope is too stiff, use plenty of lubricant.

electric starter repair

Next is the repair of an electric starting system which consists of a storage battery, starter motor, starter solenoid, safety switch and cables. This is a very easy system to troubleshoot, and it's one of the simplest in your entire outboard engine to repair.

To do the work, you should be equipped with a battery hydrometer to test battery condition and a voltmeter to check the voltage drop of the starter motor. The voltmeter should be graduated in tenths of a volt, but it doesn't have to be an elaborate instrument.

You will need a "growler" for testing starter-motor components if the motor has to be disassembled. However, I wouldn't advise buying this instrument for the rare time you might need it. First, check your local rental center—A to Z, or the like—to see if you can rent one. If not, try to borrow one from the gas station with which you do business. Growler testing takes only two minutes.

If you can't borrow a growler, take the starter motor to a starter repair shop and get it tested.

problems defined

How do you know when you have a problem in the starting system? Either the starter won't function or it will grind away very slowly (r-r-r-r-r) without the engine starting.

Should you experience a malfunction, such as starter grind or no-start, the cause could be loose or dirty electrical connections. The next most likely cause is a weak battery, followed by a defective starter solenoid or a bad safety switch. Seldom will you experience a breakdown within the starter motor itself although it can happen.

At the first sign of a starter-system failure, remove all electrical connections at the battery, starter solenoid and starter motor. Scrape them clean with a wire brush. Then reattach them firmly, making sure that attaching bolts are securely fastened.

Coat connections with liquid neoprene to seal them and prevent further corrosion. Liquid neoprene can be purchased from a dealer of marine supplies.

Next, check the battery by taking a specific gravity reading of the electrolyte with a battery hydrometer. In selecting a hydrometer, buy one that has a built-in thermometer and correction chart.

To take a specific gravity reading, draw electrolyte from each cell in turn. Be sure that the hydrometer float is free, hold the hydrometer at eye level, and note the reading. Be sure to return the electrolyte back to the cell from which it was taken.

The specific gravity of a fully charged battery is 1.260, but a battery with a specific gravity of 1.150 could start your motor. However, if specific gravity is this low, have the battery charged. If charging does not result in an increase in specific gravity in each cell, the battery has just about had it.

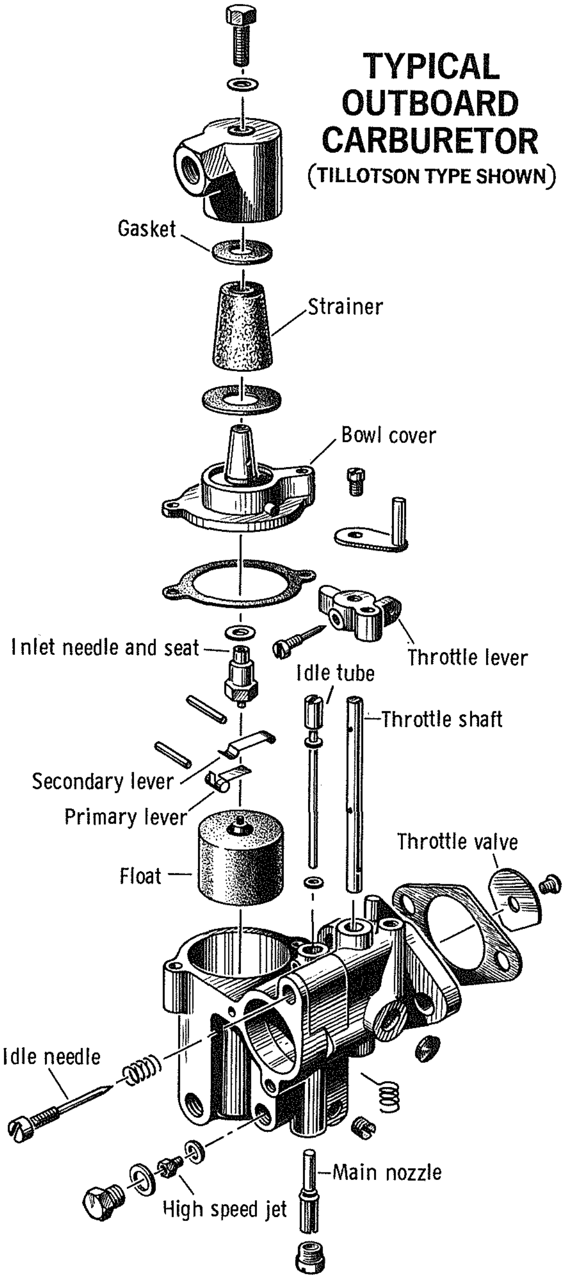
testing the safety switch

Now go to the safety switch and starter solenoid. The purpose of the safety switch is to prevent the engine from starting in gear and in neutral at too high an rpm. The switch also completes the ground circuit of the starter solenoid.

The starter solenoid makes and breaks the electrical circuit between the battery and the starter motor. If the safety switch or starter solenoid fails, there will be no starting.

To check the functioning of the safety switch, disconnect the starter terminal wire. There's only one wire. Hold the wire terminal to ground, bypassing the safety switch, and activate the ignition (Photo 19). If you get starter-motor action, it means the safety switch is either out of adjustment or is bad.

To readjust the switch, loosen it and work it back and forth (Photo 20). Place the switch's plunger on the cam of the armature plate (Photo 21). Try starting. If there is still no start, replace the safety switch.



25. THIS EXPLODED VIEW of a typical carburetor will help you work on the one on your outboard.

continued

checking the solenoid

To check the starter solenoid, place a jumper wire from either the "s" or "i" terminal to ground, and connect another jumper from the solenoid's battery terminal to either the "s" or "i" terminal—that is, the terminal not possessing the grounded jumper (Photo 22). Turn on the ignition. If the solenoid switch is in good condition, you'll hear it clicking away and the starter motor will crank as you activate ignition. If not, replace the starter solenoid.

Before replacing the safety switch or starter solenoid, there is one test you'd better make. There's always the possibility that the ignition switch and its wiring, which technically aren't part of the starter system, could be bad and thus make starting impossible.

To test the ignition switch circuit, probe the "i" ignition terminal of the starter solenoid to ground with a 12-v. test light or voltmeter. If the light doesn't glow, it means that juice is not getting to the starter solenoid and, consequently, not to the safety switch either. There's a failure either with the ignition switch or with the wiring that extends from the switch to the starter solenoid.

If switch and solenoid check out, go to the starter motor. Connect a voltmeter to the starter motor terminal. Be sure to determine the polarity of your electrical system first. Generally, Mercury, Chrysler and OMC engines are negative-grounded. Thus, the positive lead of the voltmeter is connected to the starter motor terminal, and the negative lead of the meter is grounded.

meter reveals trouble

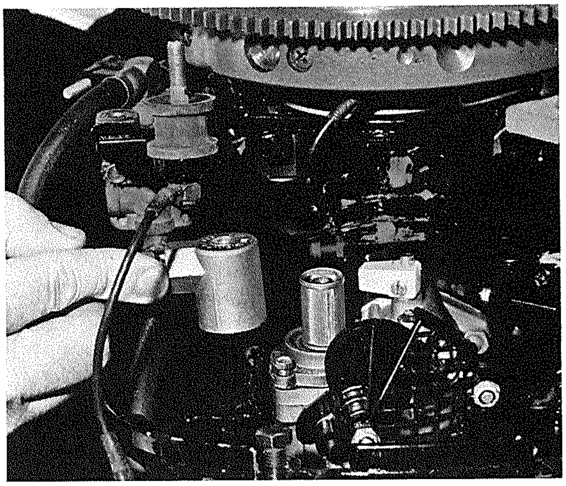
Crank the engine and observe the meter. A reading of about 9.2 volts is normal. If the drop is excessive—let's say 7 volts or less—there's a problem inside the starter. It will have to be disassembled and checked for a dirty or worn commutator, shorted turns in the armature, damaged armature windings and condition of the brushes. Here's where you need the growler (Photo 23).

Before doing this, however, see if the starter drive is worn by checking it for side-to-side play. Play should be just about perceptible. Excessive movement indicates a worn starter drive.

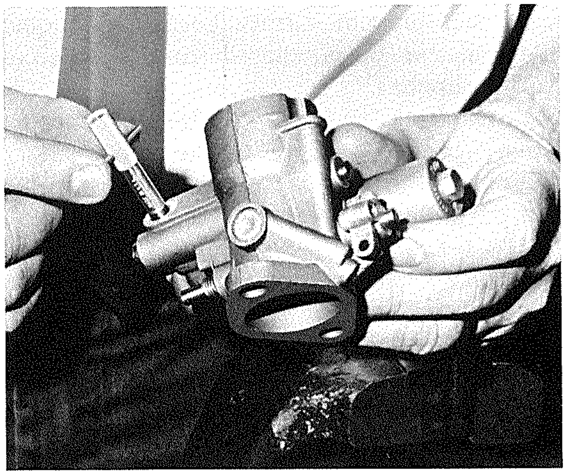
Whether you want to have a bad starter motor repaired or buy another is something you'll have to decide for yourself, but sometimes it costs just as much to turn a worn and pitted commutator on a lathe, for example, as it does to buy a rebuilt starter motor. It's advisable to check prices. Naturally, only a single part, such as brushes or an armature, may be needed. Replacement parts for starters can be purchased.

Both electric and manual starters are practically maintenance-free. The only part that actually requires periodic servicing is the battery of an electric starting system.

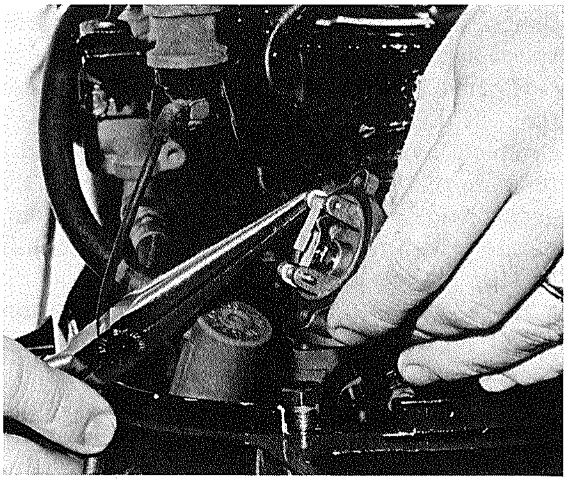
Keep the top surface clean by flushing it with water every so often. Make sure posts and terminals are free of corrosion. And be sure the electrolyte is up to level at all times.



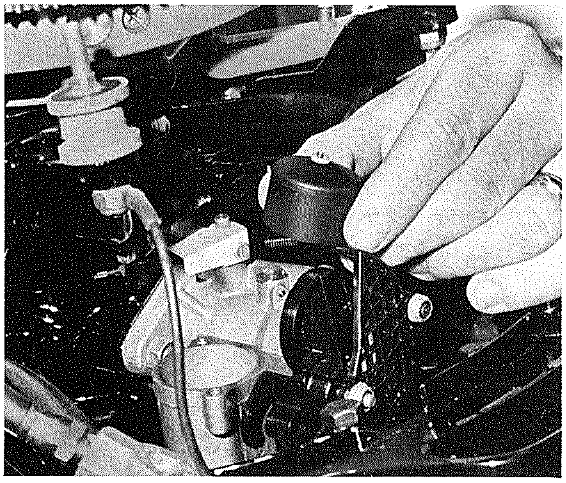
26. STRAINER COVER comes off top of carburetor to reveal the filter, which should be cleaned.



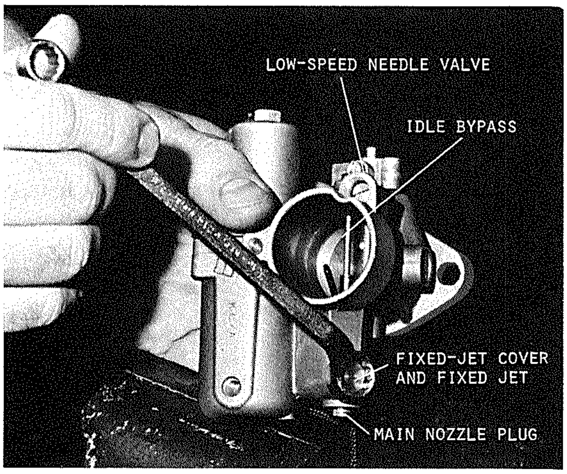
29. REMOVE fixed-jet by uncovering and unscrewing with a fixed-jet tool or an exact-size screwdriver.



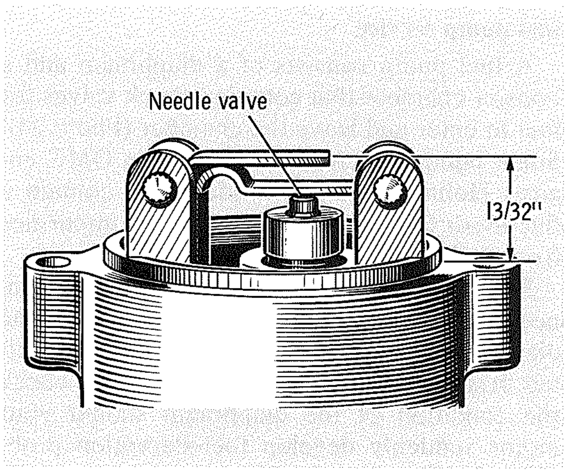
27. REMOVAL of upper float-level pin and the lever permits removal of the needle valve for inspection.



28. FLOAT is removed from bowl. Check condition. If damaged, replace. If hard rubber, clean in solvent.

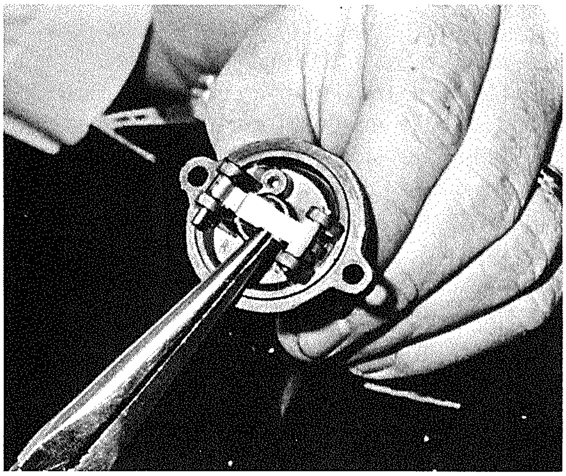


30. UNSCREW the idle bypass, low-speed needle valve and main nozzle plug. Check the parts for damage.

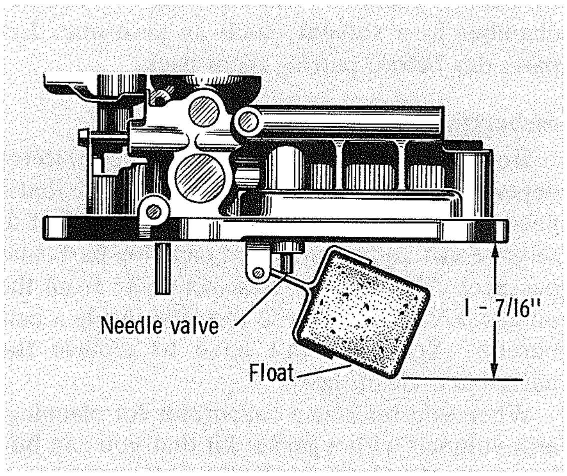


31. ADJUSTMENT of most fixed-jet carburetors is done with the carb upside down, as shown here.

continued



32. BEND the lower float-arm lever to adjust the float level on fixed-jet carburetors.



33. FLOAT of most OMC fixed-jet carbs is adjusted by bending cork-float arm to these measurements.

3. The Fuel System

■ FUEL-SYSTEM ASSEMBLIES on outboard motors are simple in make-up and easy to repair. There are two types: gravity-feed (least common) and pressure-feed.

You can recognize a gravity-feed system by the fuel tank mounted on the powerhead above the carburetor. Fuel flows downward without pressure and enters the fuel bowl. Generally, gravity-feed is used on one-cylinder models.

In the more common pressure-feed system, fuel is contained in a tank that's remote from the carburetor and is forced into the bowl by a pump. Most two-cylinder outboards use this system. This article will concentrate on maintenance of a pressure-feed system; if you can repair it, you should have no trouble with gravity-feed.

fuel pump service

A fuel pump consists of a diaphragm and a booster chamber that contains check valves for fuel to enter and leave the chamber (Photo 24). Some pumps, such as those used in OMC engines (Johnson and Evinrude), also contain a fine-mesh filter screen that removes impurities from fuel as it enters the pump.

Fuel-pump parts, including the filter, seldom need to be replaced. The only exception is the diaphragm which can become cracked and pitted. It should be replaced every year. Also check the condition of the diaphragm should your motor suddenly develop fuel-starvation problems.

To keep a fuel pump in good shape, unscrew the pump body, remove the filter if one's used, remove and replace the diaphragm, and remove the booster chamber. Wash the filter and booster chamber in a solvent, such as kerosene. Let parts dry before putting them back.

carburetor service

How far you go in working on your carburetor depends on what's wrong. Usually, all that's needed is a takedown and a wash in solvent to remove dirt and varnish that can clog parts and passages. These impurities can come from the oil-gas mixture if allowed to settle inside a carburetor. You shouldn't have to replace the parts—just clean them.

When you remove a carburetor for cleaning, arm yourself with a gasket kit that you can buy from your local marine dealer. Make sure you get the right kit for your carburetor. Replace all gaskets with the new ones. These include the flange, bowl, fixed-jet, strainer cover and low-speed needle gaskets.

If parts of the carburetor show wear, replace them. If things are very bad, you may decide a complete overhaul is necessary. You'll need a rebuilding kit that contains, among other parts, a needle and seat, a filter screen for those carburetors with filter at the carburetor inlet, idle bypass, gaskets and jets.

If you're working with a fixed-jet carburetor, you'll need a fixed-jet tool or an exact-size screwdriver to remove and reinstall the jet.

Most outboards in the 5 to 20-hp class built since 1959 use the fixed-jet concept. The high-speed control is set at the factory. Generally, it doesn't have to be adjusted. But for operation above 4000-foot elevations a smaller orifice jet is needed. Outboards in the 20-hp and larger class require a high-speed adjustment (except Mercury—all of whose models use fixed-jet carburetion).

Here's how to disassemble a carburetor (Photo 25):

1. Remove the strainer cover and strainer (filter), provided the filter is at the carburetor inlet instead of in the fuel pump (Photo 26).

If the motor is having fuel-starvation problems, remove this filter and hold it to the light. If you can't see through it, it's clogged.

2. Detach the float-bowl cover and discard the gasket. Remove the pin that holds the upper float lever and remove the lever (Photo 27).

3. Invert the float-bowl cover. The needle valve will drop into your hand. Inspect the tapered end of the valve for grooves, nicks and scratches. If the valve is damaged, replace it and its seat. Another indication of a worn needle valve or needle-valve seat is a carburetor that floods constantly. The seat is removed by loosening it from the float bowl cover.

4. Remove the float from the bowl (Photo 28). If the float is made of cork and has become oil-soaked, replace it. Do not wash a cork float in solvent. OMC engines in general use cork floats.

If the float is made of the hard-rubber compound used generally in Mercury and Chrysler outboard motors, it can be cleaned in solvent. If the float is damaged, replace it.

5. Unbolt the carburetor body from the engine.

6. If the carburetor is of the fixed-jet type, remove the fixed-jet cover and, with the right tool, remove the jet (Photo 29).

7. Unscrew the idle bypass, low-speed needle valve and main nozzle plug (Photo 30). If the

carburetor isn't fixed-jet, remove the high-speed needle valve. Check each part. If damaged, replace it.

Wash all parts in solvent and let them dry. Then, in reverse order, put them back into the carburetor body. Use the fixed-jet tool to run the jet up tight.

making adjustments

With the carburetor reassembled, and before putting the float bowl cover back, you have to adjust the float setting. Then, with the carburetor all in one piece, you have to adjust the low-speed needle valve according to the owner's manual. If the carburetor isn't a fixed-jet type, you also have to adjust the high-speed valve.

There is no single adjustment measurement for the float setting. It varies.

Mercury fixed-jet carburetors of the type seen in this article call for a setting of $^{13}/_{32}$ inch. The measurement is made as seen in Photo 31. To adjust, bend the lower float arm lever (Photo 32).

With most OMC fixed-jet carburetors of modern vintage, the measurement is $1^{7}/_{16}$ inches. Invert the float body so the float drops and measure from the bottom of the float to the bowl cover body (Photo 33). Adjust by bending the float arm.

To make the low-speed needle adjustment, warm the engine and idle it in forward gear. Open the needle until the engine starts to load up and fire unevenly. It's running rich.

Now, close the needle slowly until the motor slows down and starts to misfire. It's running lean. The best adjustment for the low-speed needle valve is halfway between these rich and lean settings.

By the way, if you can't make the adjustment, check the needle. It's probably damaged and has to be replaced.

high-speed adjustment

In an engine without a fixed-jet, you have to adjust the high-speed needle. Warm up the engine and operate it at full throttle. Run the needle up slowly until it is firm. Do not force it. Now, back it off from a half to three-quarters of a turn.

Now that the carburetor is adjusted, let's check the last part of the fuel system—the fuel tank. Remove the filter and clean it. A clogged filter cuts off fuel.

The only regular maintenance needed on the fuel system of your motor is a periodic cleaning of filters. Also, run the carburetor dry before stowing your motor for the day. This cuts the possibility of varnish and residue accumulating.

The following troubleshooting chart will allow you to pinpoint the fuel system component that is causing a headache:

FUEL-SYSTEM TROUBLESHOOTING CHART

PROBLEM	POSSIBLE SOLUTION
Engine hard to start or won't start	•Make sure you have fuel •Check gas-tank vent to make sure it's open •Check fuel line for kinks •Check fuel for water. Let some fuel evaporate in your hand. Water, if any, will remain •Check fuel filter for clogging dirt •Check carburetor adjustments. The mixture could be on the lean side
Motor misses at low speed, or motor doesn't idle smoothly	•Low-speed needle may be out of adjustment •Check fuel mixture
High-speed motor miss	•Check for water in fuel •Make sure fuel-pump cover is not leaking air •Check fuel-pump diaphragm
Engine coughs, spits, slows down	•Check high-speed adjustment. It might make the mixture too lean. •Check float level. It might be too low •Check fuel-pump diaphragm for dirty check valves and loose cover •Check to see that fuel-tank filter is not clogged •Fuel passages in carburetor may need cleaning

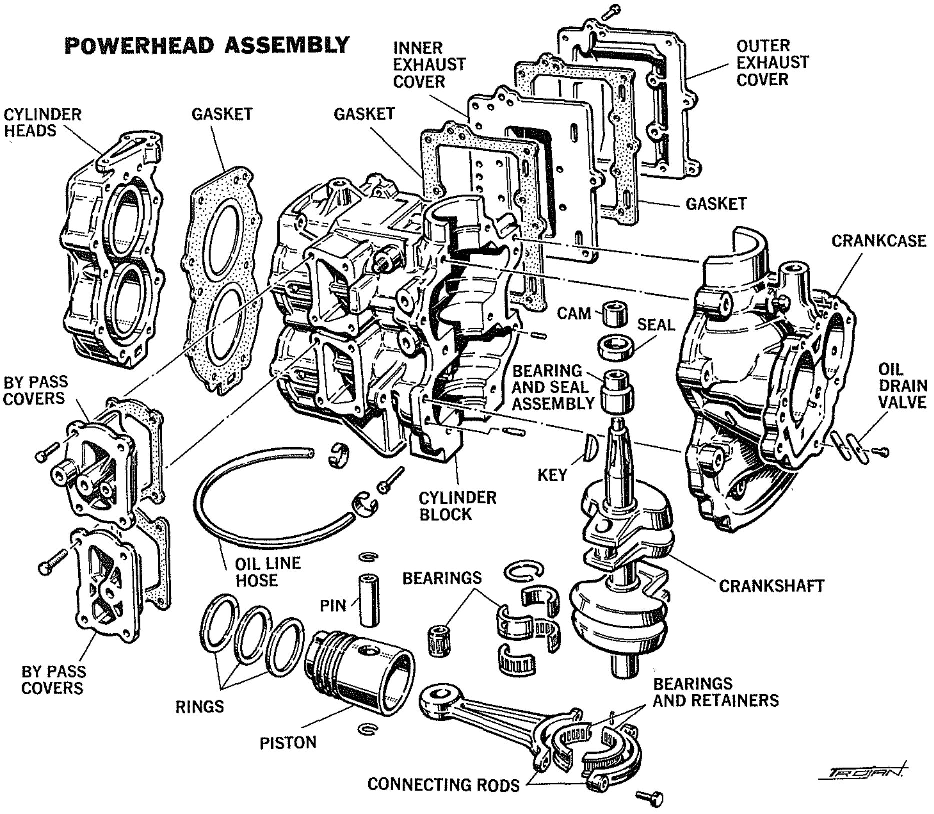
4. The Powerhead

THERE ARE TWO WAYS to tear down a powerhead: minor and major. A minor disassembly allows you to repair such damage as a blown head gasket, a reed-valve failure and carbon buildup in exhaust ports and around cylinder heads. It also lets you look inside the motor to see if a major tear-down is necessary.

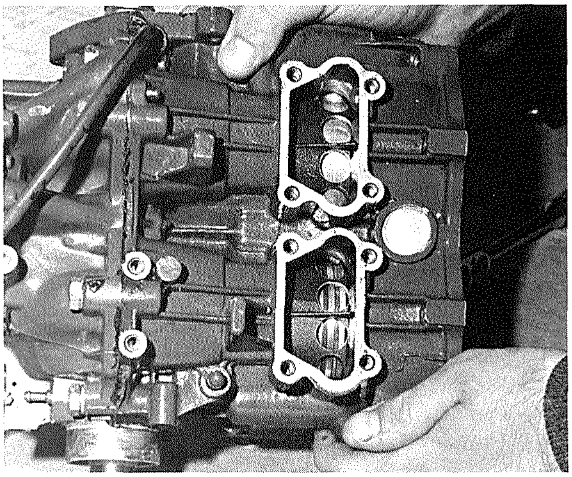
If there's an indication of damage that you can't observe directly—such as worn main bearings or a bent connecting rod—you'll have to commit yourself to a major disassembly.

A list of powerhead troubles and how they usually make themselves known is provided at the end of this section. However, a word of caution: Be sure that all other causes of a problem are investigated before you tear into the powerhead. Wouldn't you be red in the face to find out that the cause of an engine knock was advanced ignition timing and not the pistons you're holding in your hand?

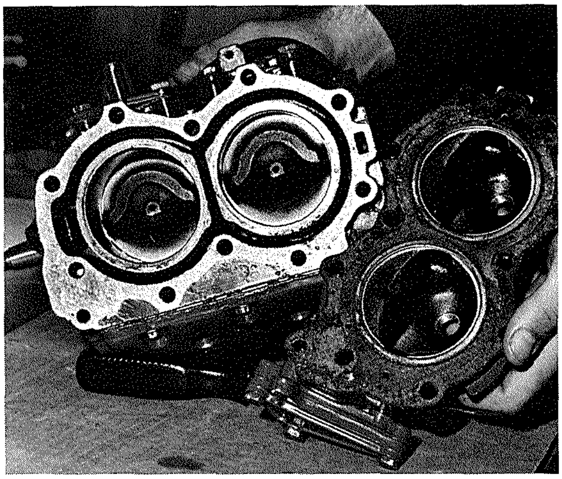
THE POWERHEAD



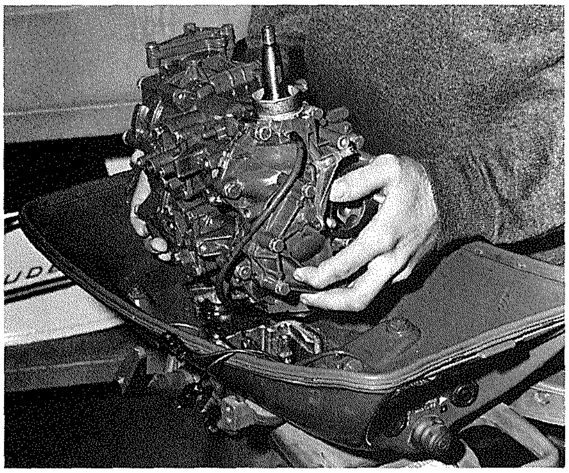
34. THIS DRAWING of a typical powerhead assembly will help you in a minor or major assembly.



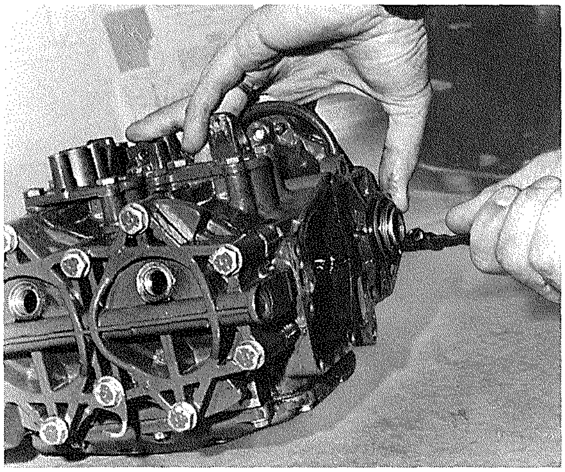
39. PART OF THE PISTON RINGS and some of piston surface are exposed when bypass cover is removed.



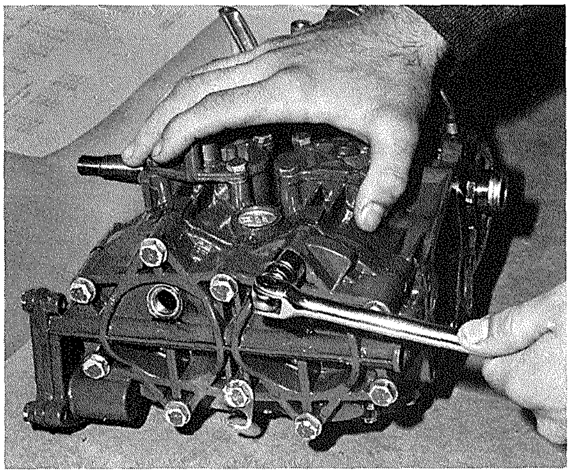
40. WITH CYLINDER HEAD removed, examine tops of pistons, part of cylinder wall, all of cylinder head.



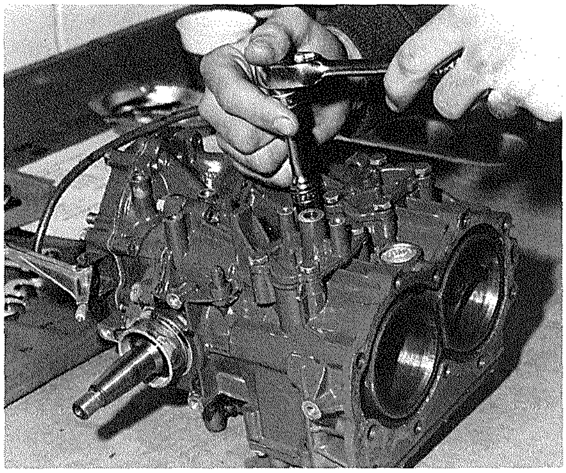
35. LIFT POWERHEAD from exhaust housing after all external engine parts and screws have been removed.



36. IF YOU DECIDE to rip the powerhead down completely, you must remove carbon seal. Pull retainer.

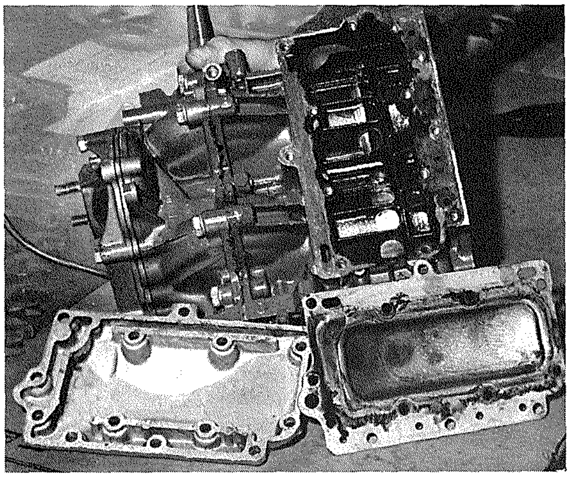


37. CYLINDER HEAD often has carbon build-up. Remove it and clean it thoroughly in a solvent.

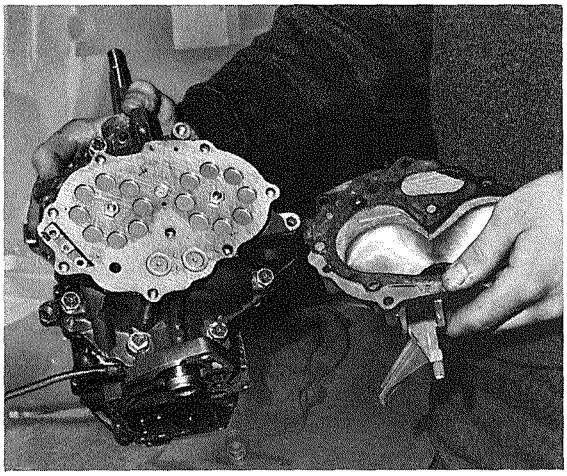


38. TAKE OFF the bypass covers. Once they are removed, you can get an idea of block's condition.

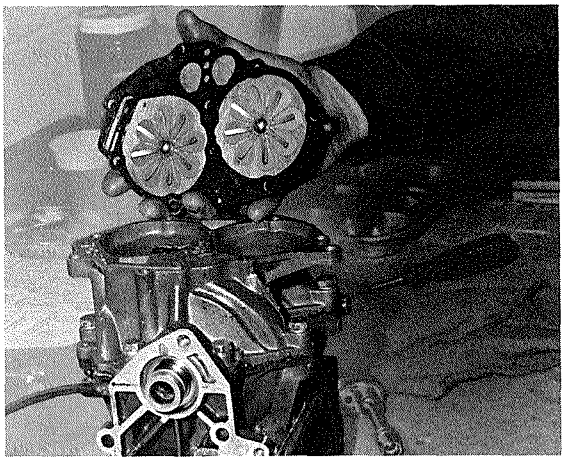
continued



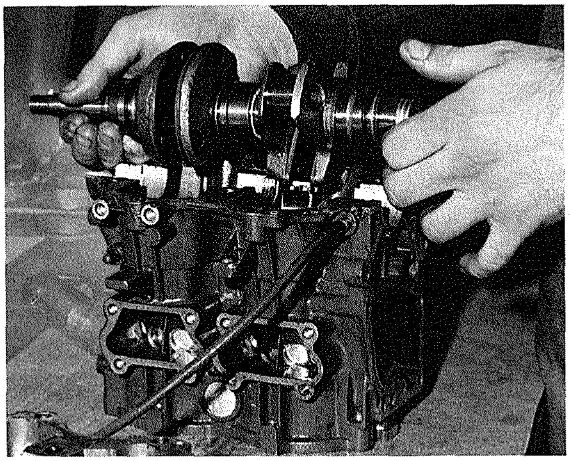
41. WITH EXHAUST COVERS removed, you'll see side pistons opposite from view through bypass cover area.



42. REMOVE INTAKE MANIFOLD COVER to reach reed valves. Reed valve plate is held by single screw.



43. BE SURE TO EXAMINE reeds carefully for gum deposits, varnish, distortion, any broken pieces.



44. REMOVE CRANKSHAFT after connecting rod retainer and bearings are disconnected and removed.

important question

An important question you will have to answer is whether to do a major disassembly yourself or to let a professional shop do it for you. There's no doubt that any competent reader can tear the engine apart. But then what are you going to do afterwards?

Suppose, for example, that the cylinder walls show wear, requiring reboring to accommodate oversize pistons. Do you have the reboring tools necessary for this job? If not, would it be less expensive for you to let an outboard repair shop do the whole disassembly and repair job?

Even if reboring isn't necessary, the cylinder walls should be honed and new rings installed while the engine is stripped down. Do you have a cylinder wall honing tool? Do you have a ring expander? Would it be worthwhile to buy them?

All two-cylinder outboard motors are disassembled in pretty much the same way. As you work, be sure to follow these basic guidelines:

- Place parts with their respective fasteners in order of disassembly. This will facilitate reassembly.
- As you perform disassembly, make notes and diagrams of the procedure so that reassembly will be simplified.
- Be observant. Examine everything before you take it off so you'll know how it goes back on. For example, a piston has to be put back into the cylinder with the concave (intake) side of the deflector toward the intake port.
- Keep things clean. Replace worn parts, also all old gaskets and seals.

starting disassembly

To disassemble the powerhead (Photo 34) you have to start by removing the powerhead from the rest of the outboard. Remove all external engine parts: carburetor, flywheel, fuel pump, starter, magneto and so on.

Now, remove the screws that attach the powerhead to the exhaust housing, and lift the powerhead carefully to disengage the crankshaft from the driveshaft (Photo 35). Place the powerhead on the bench.

Remove the carbon seal from the lower end of the crankshaft (Photo 36). This seal sits atop the crankshaft lower main bearing. (However, you need not remove it if you are not doing a major disassembly.)

Remove the cylinder head, bypass (cylinder block) covers and the exhaust covers (Photos 37 and 38). You can now peer inside the block and partially check for cylinder wall damage, carbon accumulation, piston wear and scoring, and piston ring wear (Photos 39, 40 and 41)

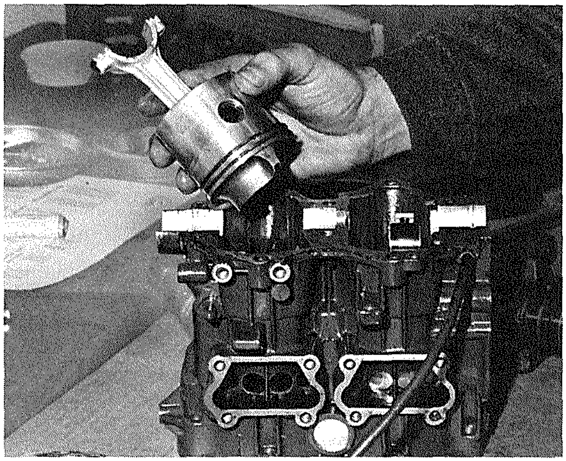
The final task in performing a minor disassembly is to remove the intake-manifold cover, which reveals the reed valves (Photo 39). These components do the same job as intake valves on a car—they allow fuel to enter the combustion chambers in measured amounts.

reed valve inspection

Remove the reed valve assembly and inspect the leaves to be sure that they're free of varnish and gum, that they lie flat and aren't distorted, and that none are broken (Photos 42 and 43). If one is damaged, replace all the leaves by simply unscrewing the leaf assembly from the leaf plate.

If this is as far as you're going, carefully clean all parts and castings, especially the cylinder head. Replace all gaskets.

Now, if you determine that the rest of the engine has to come apart, detach the crankcase



45. ONCE THE CRANKSHAFT has been taken from the engine, you can lift pistons out for inspection.

from the cylinder block to uncover the crankshaft. Disconnect the connecting rod retainers from around the crankshaft and carefully remove the connecting rod bearings.

Next lift the crankshaft from the cylinder block (Photo 44). Remove the crankshaft main bearings for cleaning and inspection. Lift the pistons and connecting rods from the cylinders (Photo 45). You are now ready for overall inspection.

Start with the crankshaft. Check all bearing surfaces for any rust and pit marks. Clean rust off with a very fine emery cloth. If the shaft is pitted badly enough so that your fingernail catches as it scrapes over the surface, replace the shaft.

checking alignment

Each journal and each throw of the crankshaft should be checked for alignment with a dial indicator.

Check connecting rods for rust and alignment. If a rod shows the least sign of being bent, discard it.

Before you check the connecting rods, disconnect them from the piston. Make sure the piston pin that holds the rod to the piston provides a sound fit when you reassemble them. The piston should not feel loose.

Replace needle bearings. Ball bearings, if undamaged, can be cleaned and reused.

Check pistons for scoring and cracks. If a piston has been scored or the metal is damaged, replace it. Clean off all carbon. Replace piston rings.

Check cylinders for wear and accuracy with an inside telescopic gauge and micrometer. If the cylinder is out of round, you can either rebore it so that it will accept oversize pistons, or replace the block.

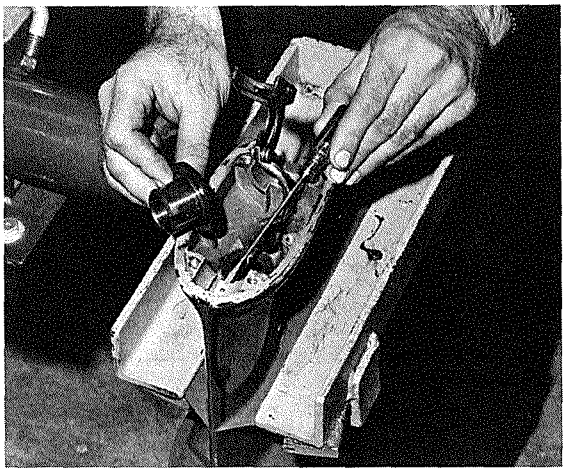
Inspect the block thoroughly for cracks. Hone the cylinders to remove glaze and to provide a slightly roughened surface for seating the new rings properly.

POWERHEAD TROUBLESHOOTING CHART

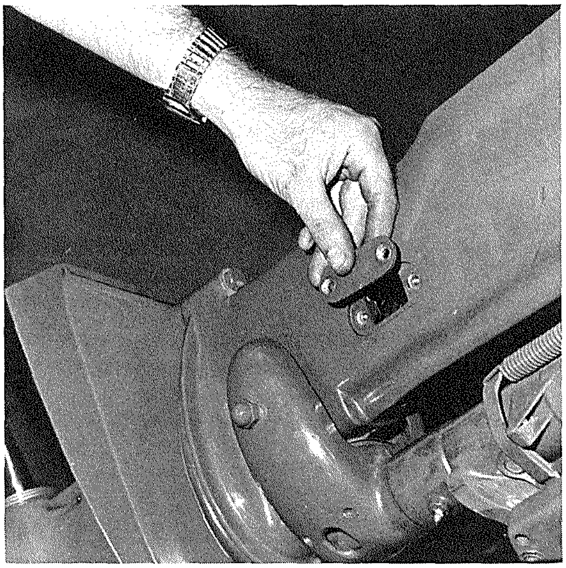
PROBLEM	POSSIBLE TROUBLE
Hard to start or won't start	Reed valve failure
Low-speed miss (rough idle)	Leaky or blown head gasket Leaky or blown reed plate gasket Leaky crankcase seal Bad carbon seal
High-speed miss	Leaky head gasket Leaky exhaust case gasket Carbon in combustion chambers
Coughs and spits	Reed valve failure
Runs, then slows and stops	Fouled combustion chambers
Won't start, backfires	Reed valve failure
No acceleration, low top rpm	Reed valve failure Blown head gasket Blown exhaust cover gasket Scored cylinders or stuck rings Carbon buildup on piston head
No power under heavy load	Scored cylinders or stuck rings Carbon buildup on piston head
Engine won't crank over	Broken connecting rod
Motor overheats	Obstructed water passages Bad seals and gaskets Cracked cylinder housing
Motor knocks	Worn or loose bearings, pistons, rods or wrist pins Carbon in combustion chambers and exhaust ports
Motor stops suddenly (freezes up)	Rusted cylinder or crankshaft Bent or broken connecting rod, crankshaft Stuck piston

5. The Lower Unit

■ ENEMY NUMBER ONE of a lower unit is lack of proper maintenance. Failure to use the correct lubricant as recommended by the manufacturer is a greater cause of damage to your lower unit than those occasional underwater obstructions you may bump over.

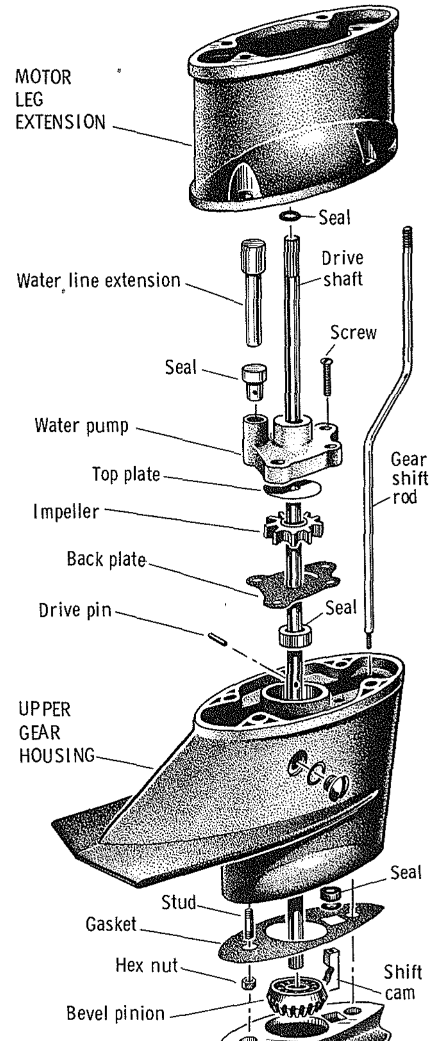
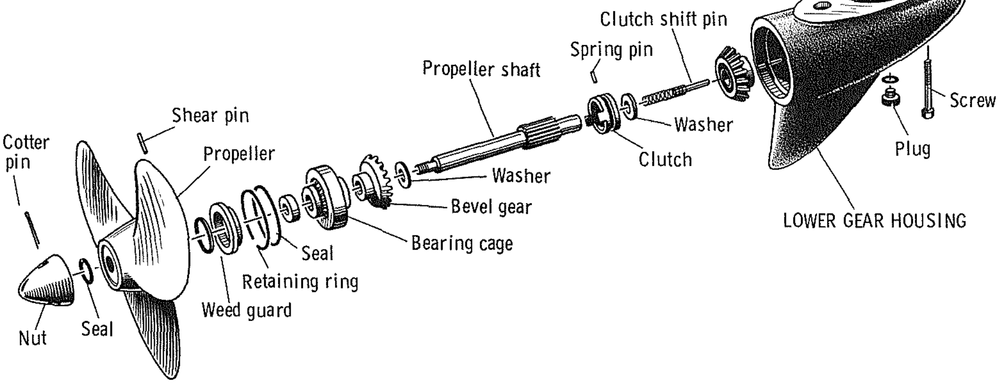


46. EXAMINE EACH PART carefully on disassembly so you'll be prepared to reassemble correctly.

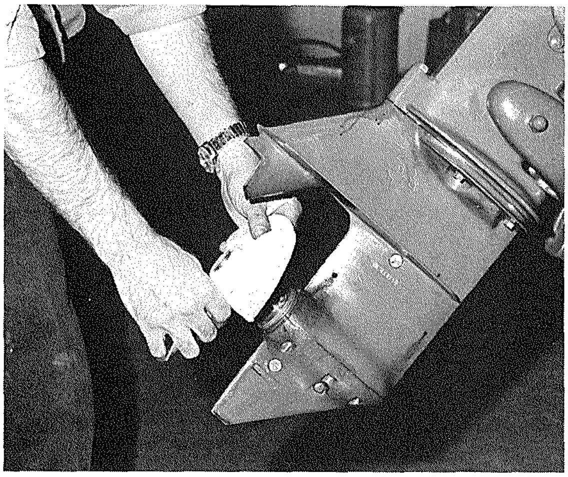


47. THIS INSPECTION PLATE is found primarily on Chrysler, Johnson and Evinrude outboard motors.

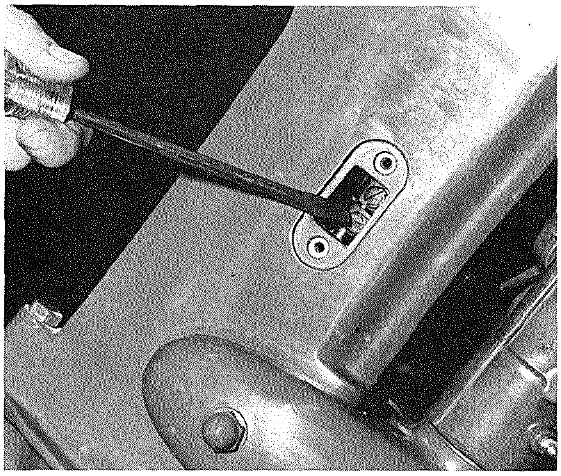
THE LOWER UNIT

48. EXPLODED VIEW of a typical lower unit will assist you in disassembly of your outboard's unit.

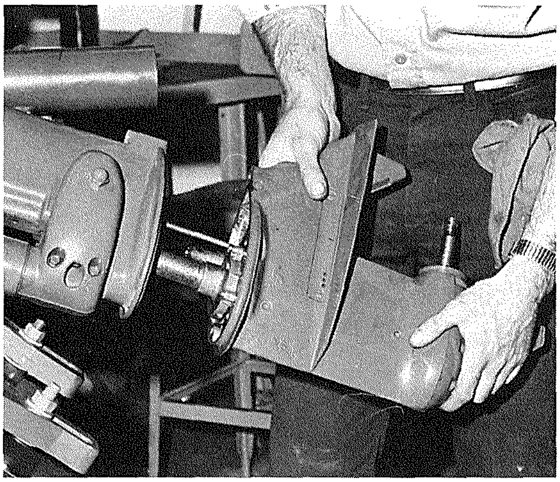


49. BEGIN LOWER-UNIT REPAIR WORK by removing the propeller and draining the gearcase of lubricant.



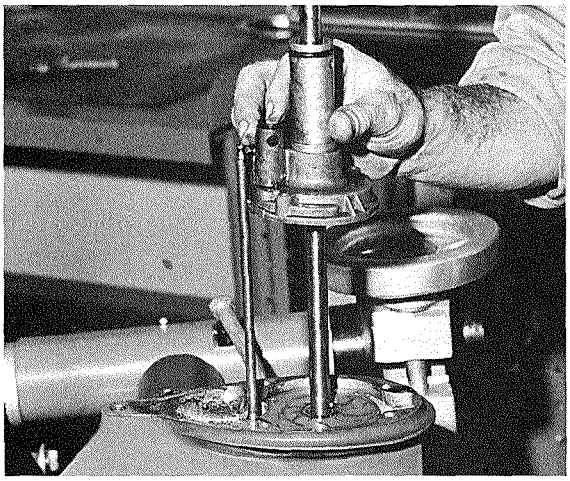
50. IF YOUR UNIT is this type, remove inspection cover and unscrew lower pin to disengage shift rod.

51. REMOVE FASTENERS that hold gearcase to the exhaust housing; store in handy place for reassembly.

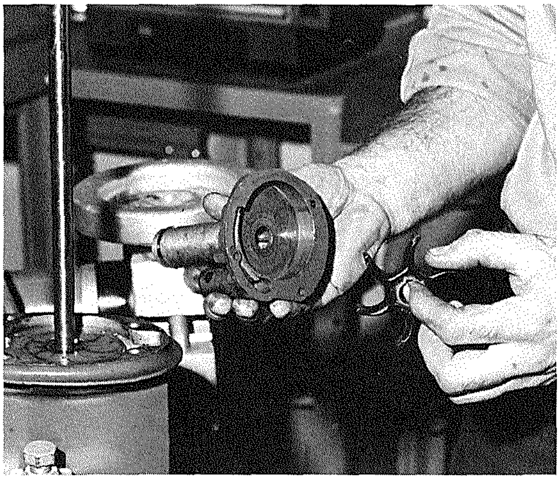


52. PULL GEARCASE FREE of exhaust housing. Inspect the machined surfaces for nicks.

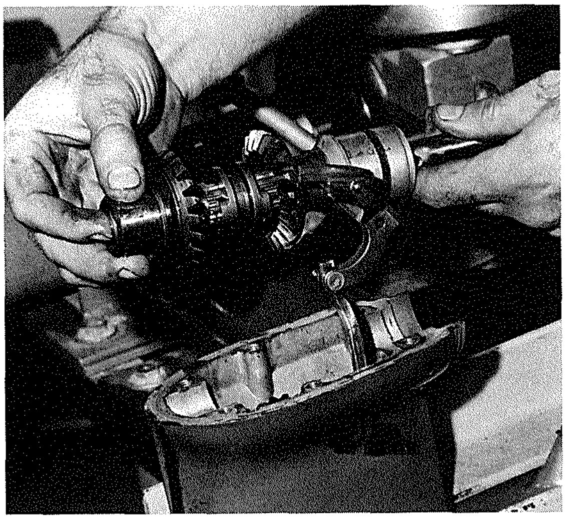
continued



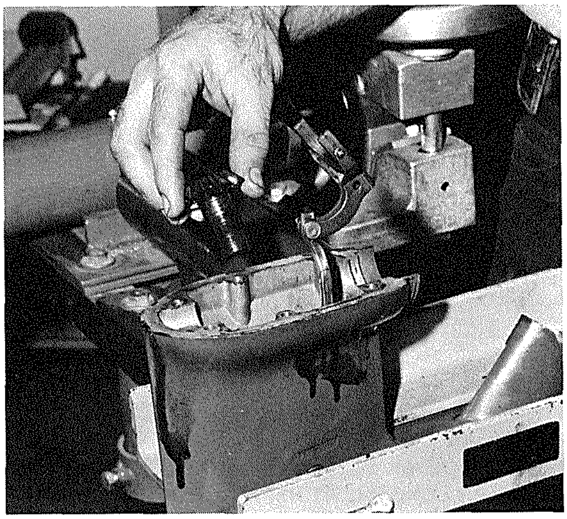
53. DETACH WATER-PUMP HOUSING, slide off shaft.



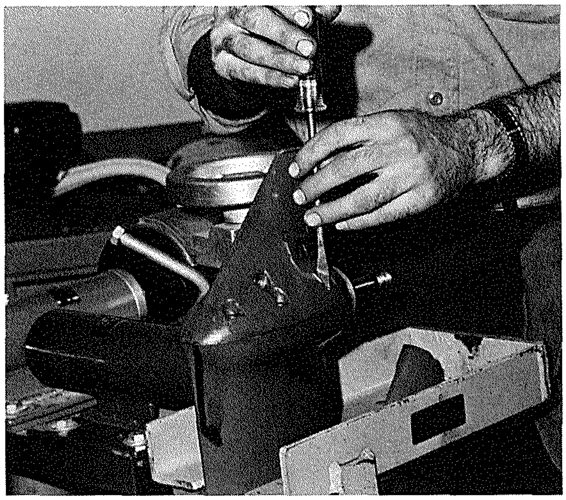
54. REMOVE IMPELLER from the water-pump housing.



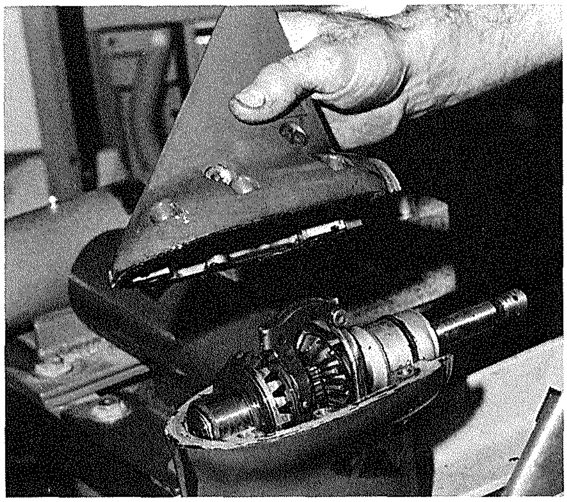
55. **REMOVE PIVOT PIN** and screws to free the skeg.



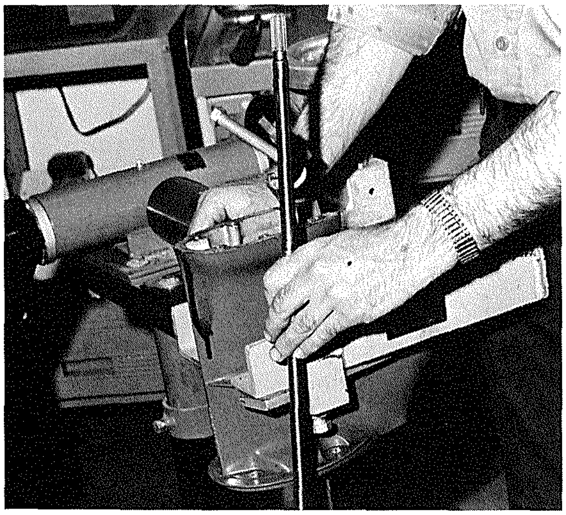
56. **EXPOSED GEAR TRAIN,** after removal of skeg.



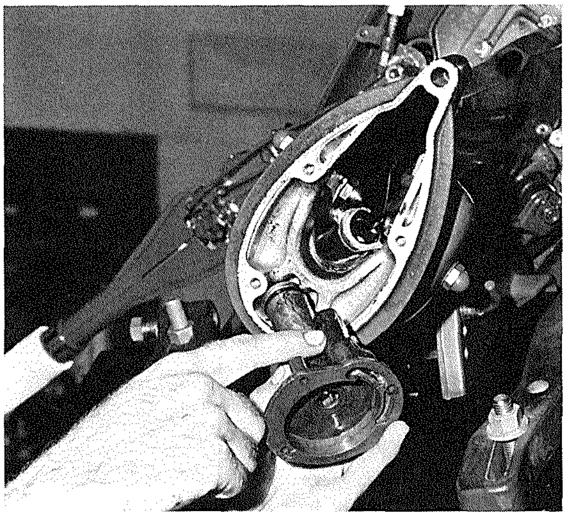
57. **LIFT GEAR TRAIN** carefully from the gearcase.



58. **REMOVE PINION GEAR,** then the thrust washer.



59. **REMOVE DRIVESHAFT** and, if bent, replace it.



60. **CHECK WATER TUBE** fit in water-pump housing.

Lower-unit trouble can be detected in one of three ways:

1. The engine won't shift into foward and/or reverse.
2. It can be shifted into forward, but not back into neutral.
3. It jumps continually in and out of gear.

Do you have a remote-control shifting arrangement? Before tearing into that gearcase, better make certain the remote control mechanism isn't the cause of your problem. To test it, disconnect the remote-control unit cable at the motor and shift the motor by hand. If the engine now shifts properly, the problem is the remote control unit. If not, the trouble is in the gearcase.

guidelines for repair

You need no special tools to disassemble a mechanically operated lower unit. But you do need patience, a go-slow approach and a keen eye, especially in your first attempt at lower unit work. If you observe the following guidelines, you should have little trouble:

- As you disassemble, make notes and diagrams of what you've done so that reassembly will be easier.
- As you take down each part, examine it carefully to determine if there's anything special about the way it goes together (Photo 46). For example, in the 18-hp Evinrude used in the illustrations, there's a slot in the front roller bearing that has to fit into a small dowel pin in the gearcase. Otherwise the entire gear train is thrown out of line!
- Keep everything clean, especially when reassembling. If dirt gets on the gears, they will grind themselves to pieces.
- Discard all old seals, O-rings and gaskets for new ones. Most manufacturers issue these in kit form, and you can get them from a dealer of marine supplies.
- If any component, such as a water-pump impeller, is bad, buy it separately.

Basically, there are two types of lower units. One employs a spring-loaded ratchet-type shift dog in forward gear. Mercury makes wide use of it. The other type has a nonspring-loaded, ratchet-type shift dog in forward gear. You'll find it primarily on OMC and Chrysler motors. Its shift rod has to be disconnected before you can drop the lower unit.

To tell which setup you have, examine the lower-unit case. If you find a little inspection cover, your unit is a nonspring-loaded type (Photo 47).

Follow the step-by-step plan of photos 48-60 to take your lower unit apart. Clean all parts in a solvent—kerosene is okay—and let dry. Compressed-air drying is best, but normal air will do. Inspect all parts carefully. If you're not sure whether a part is damaged, don't take a chance. Get rid of it.

Here are a few tips for inspecting lower-unit parts:

- Inspect the driveshaft splines for wear and replace the shaft if it's bent.
- Inspect the gearcase. If it's nicked on any machined surface, the damage must be repaired and the case face resurfaced. The same applies to the surface of the exhaust housing. Let a professional do this. He has the surface plate, surface gauge and scriber needed for such work. If the gearcase is bent, replace it.
- Inspect water tube for obstructions.
- Inspect the water-pump impeller and replace it if vanes are damaged or worn.
- Inspect water-pump housing, drive gears, clutch dog, pinion gear, bearings, and thrust washers for wear. Replace all damaged parts.
- Don't forget the propeller. Minor nicks can be removed with a file. But a broken or cracked blade means that the propeller should be replaced. It's also a good idea to check the prop pitch on a pitch block.

reassembling advice

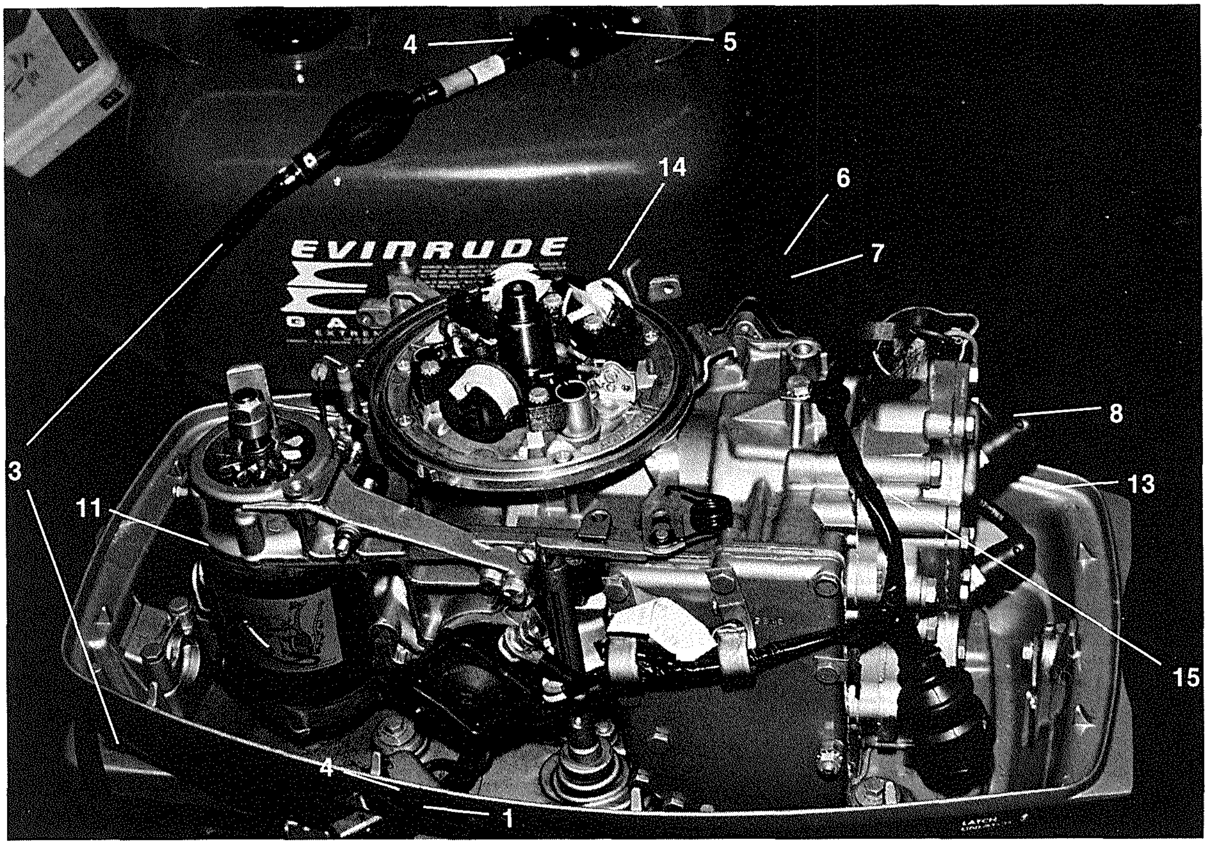
When reassembling remember that machined surfaces between two parts, primarily between skeg and gearcase, and gearcase and exhaust housing, must be sealed with a marine sealer. Also be sure that screws holding these components are sealed. Dip them in a sealer, such as Perfect Seal No. 4, before they're run up tight.

When the lower unit is reassembled, refill it with gearcase lubricant. It's wise to lubricate all other parts relating to the unit, such as clamp screws, swivel-bracket fittings, throttle-shaft bushings and gears.

Finally, outboard-engine manufacturers stress two basic rules for proper handling of the gearshift.

1. Shift at recommended idle speed only. (Consult your owner's manual—it's usually 600 rpm, plus or minus 100.)
2. Shift smartly with a quick motion of the gearshift lever. Don't ease into gear, and don't wrench your control over.

If you follow these guidelines and the manufacturer's suggestions, your takedown of an outboard motor's lower unit should be limited to a once-in-a-lifetime experience.



NUMBERS LOCATE the parts of this electric-start outboard motor referred to in the text.

Troubleshooting an outboard that won't start

By **HENRY B. NOTROM**

■ NOTHING DEFEATS a boatman quicker than an outboard that refuses to start. Before you yank your arm off pulling the starter cord, or kill the battery on an electric start, take a few minutes to troubleshoot the problem.

First, make sure you've got fuel in the tank.

Second, make sure the fuel line is pushed *all the way* into the fuel tank at one end and to the fuel pump line connection at the other (1). (See the photographs on these two pages.

Third, squeeze the fuel-line pressure bulb. It should be hard.

Fourth, determine whether fuel is contaminated. Let some drip into the palm of your hand then blow on it. If fuel is loaded with water or dirt, you'll see it as the gas evaporates. Dump that bad fuel.

If this doesn't get you started, find out whether the problem is a clogged fuel system forward of the carburetor. Unscrew the high-speed needle or drain plug at the head of the carburetor (2). If fuel doesn't pour from the hole, you know immediately that a stoppage exists somewhere between the gas tank and the carburetor inlet. Here's how to track it down.

Look for a kinked or ruptured fuel line, and make sure the fuel tank isn't lying on top of the fuel line (3). Check for chipped O-rings inside the fuel-line connectors at both ends of the line (4). These are used to seal the line. If one's bugged, air can be diluting fuel, preventing easy starts. Replace it.

Check for a clogged fuel tank vent. Remove the gas cap. If air rushes in, put the cap back on and try to start the engine. If it starts, you can figure the vent's clogged.

Some tanks have the vent in the upper housing

SEE ALSO

Batteries, boat . . . Boat repair . . . Boating . . . Boats . . . Compasses, marine . . . Pontoon boats . . . Propellers, boat

and fuel line assembly (5). Replace the entire assembly. Other tanks are vented by means of a vent hole in the gas cap. Replace the cap.

filter screens can clog

A clogged filter screen inside the gas tank can keep fuel from getting to the fuel pump. Unscrew the upper housing and fuel line assembly. Pull it out. Clean off the filter screen at the base of the long pipe.

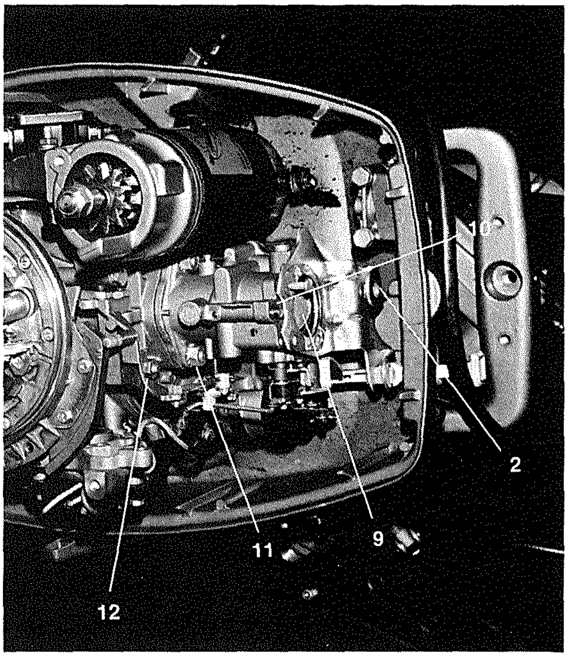
Check the fuel pump (6). You could have a clogged fuel filter inside the fuel pump housing (7). Some model outboards, like the one shown here, have the filter in a housing over the pump. Other models have this filter cut into the fuel pump-to-carburetor inlet. In any event, when a fuel stoppage shows up, always remove and clean the in-line fuel filter.

Tighten fuel-pump housing bolts. If this doesn't get the engine started, remove the fuel-pump cover and replace the pump diaphragm.

Okay, suppose when you removed the high-speed needle or drain plug, gas did pour forth. You have to see whether fuel is getting from the carburetor to the combustion chamber, so prime the engine and remove a sparkplug (8).

A wet plug means the engine's getting gas, but maybe it's getting too much or not enough. Check the choke plate to make sure it's not stuck in either the closed or open position. (9). Follow with a check of the low-speed idle adjustment (10). Turn the adjustment screw a little at a time to one side, and then the other. Try to start the engine at each setting.

ANOTHER VIEW of the same motor shows other parts you should be familiar with as you troubleshoot.



If fuel is not getting to the combustion chamber but is getting to the carburetor, the trouble lies inside the carburetor or with a reed valve that isn't working right. To fix it, you'll have to remove the carburetor (11). Take it down; clean it; and install any new parts if needed.

You remove the reed valve assembly by taking off the manifold (12). If you're faced with this project, you can forget about fishing for the day. Reed valves that are gummed up—a rare problem—can be cleaned with gasoline. If it is damaged, replace it.

ignition system checks

The cause of your engine problem could lie within the ignition system. So, while you have the sparkplug out checking for fuel in the combustion chamber, hold the plug one-half inch from a clean ground on the powerhead and crank the engine. Absence of a strong blue spark signifies ignition troubles. But where?

Probably with the sparkplug itself, since 90 percent of ignition problems involve this part. Replace a cracked or damaged plug. Make sure the electrode gap is set to specifications.

Check lead wires for breaks in insulation (13). Replace any defective wires.

check magneto or distributor

If nothing to this point helps, the flywheel has to come off for a check of magneto components (14) or, if your engine is so equipped, you'll have to remove the cap for a check inside the distributor.

Inspect ignition points first for proper gap and a burned or dirty condition. If the points seem okay, the cause of your ignition failure is probably a weak coil or condenser.

With an engine that has a distributor, check the distributor cap for cracks and burned contacts, and check the condition of the rotor before replacing the coil.

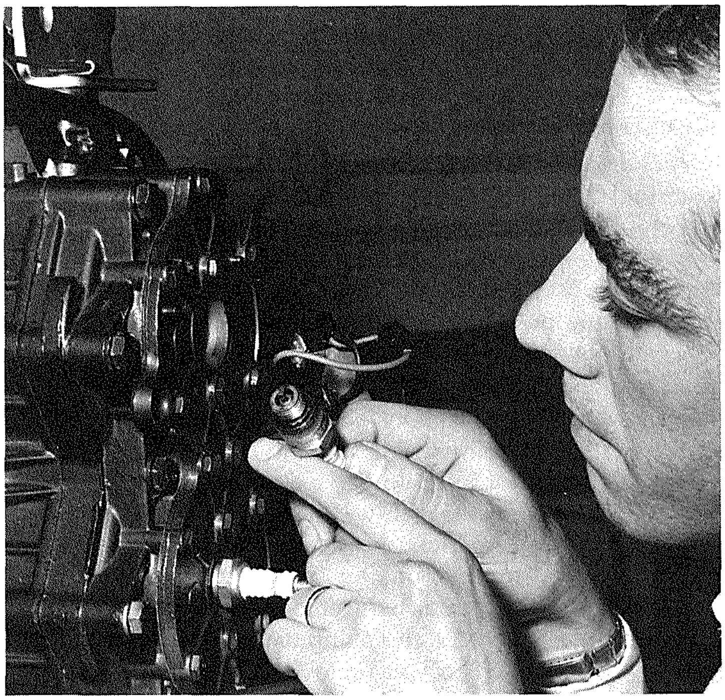
There's one other major cause of an outboard's refusal to start—a ruptured cylinder head gasket (15). If everything else so far has failed to help, that's a good place to turn.

Simple troubleshooting of today's larger and more complex motors can often reveal a minor problem that you can quickly put right. But when it comes to digging deep into a large sophisticated motor—75 hp and up—take it to trained personnel unless you're a mechanic.

Why is your motor missing?

By MORT SCHULTZ

A missing outboard motor need not shut you down—providing you know how to track troubles to their origin. Here's how to save time as you work



STUDY SPARKPLUG TIPS for vital clues to your outboard's problems.

▩ A MISSING OUTBOARD motor is a challenge. It practically dares you to locate the cause of the trouble. And here's where you will find the path to follow in your search.

Strict constructionists may use *miss* only in referring to trouble from an ignition system malfunction. Obvious candidates are bad sparkplugs, a weak coil or condenser, poor breaker points, loose or bad wiring, or—on some engines—a weak cutout-switch spring.

Despite the similarities, the same strict constructionists won't describe an engine that idles roughly as one that's missing. Rough idle is more often the result of a malfunction far removed from the ignition. It can well come from a fuel problem—perhaps a carburetor out of adjustment.

Nevertheless, the symptoms are close to those of a missing engine. So we'll look at both of these diseases here.

check the plugs first

First thing to do when an engine develops a miss is to pull sparkplugs for a close-up examination. If there's water on electrodes, the head gasket could be blown between water jacket and cylinder. This causes a miss at any speed! Verify it by pulling the starter cord slowly. If there's no snap to the engine, you have a loss of compression, caused by a blown gasket.

If sparkplug tips are prematurely eroded or the porcelain is marked with tiny blister bubbles or is cracked, one of three things is causing your trouble: a too lean fuel mixture, a spark that has been advanced too far in an effort to overcome the effect of fouled breaker points, or an overheated plug.

Dump the old fuel, mix a new batch properly, and confirm the air-fuel mixture is right. Make sure you're using the right plug. If conditions still don't square away, pull the flywheel or open up the distributor for a look at the points.

A deposit between ground and center electrodes means carbon has built up in the combustion chamber. It will cause a high-speed miss. Buy a can of good quality engine cleaner from a marine dealer and use it as directed.

If missing occurs at low speed or idle, and sparkplugs are oil-fouled, fuel may not have been mixed properly or the plugs may be too cold for the engine. The other possibilities: a plugged crankcase bleeder, clogged check valves, or a blocked breather line.

SEE ALSO
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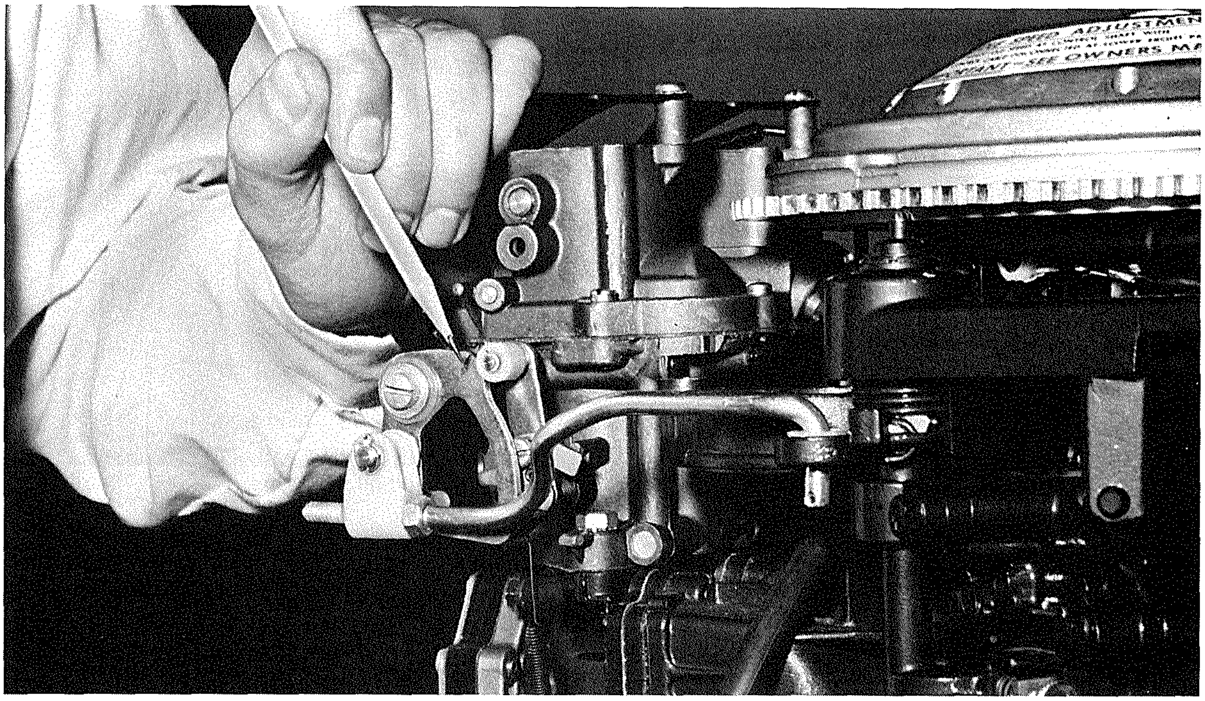


ALIGN THROTTLE CAM mark (pencil tip) with the cam follower to adjust synchronization.

Dump the fuel and mix a new batch. Check plug specs against the book. Clean out bleeder, check valves, or breather lines—or all of them—with compressed air.

Naturally, a major cause of missing at any speed is dirty and improperly gapped plugs.

leaks into crankcase

A hard-to-correct miss at low speed or idle is often caused by leaky crankcase halves or leaking top and bottom crankcase seals. If there is excessive oil over the top of the engine and breaker-point assembly, it means the top crankcase seal is probably bad. If there's a leak between crankcase halves that has to be patched, you'll spot bubbles of oil while the engine is running.

Problems with the reed valve provide another prime source for missing—or roughness—at idle. If the engine continually spits at low speed and you have to open the carburetor low-speed adjustment screw excessively to compensate, there's an air leak at the reed-valve plate gasket.

If the low cylinder isn't firing, the reed valve has gone bad. Normally when this happens, fuel will shoot out the front of the carburetor.

A low-speed or idle miss sometimes occurs when the carburetor and ignition are out of synch. The mark on the throttle cam has to be aligned properly with the cam follower. Otherwise the engine will operate under lean fuel conditions. Checking and adjusting this synch is done differently for different engines, and you'll need a service manual.

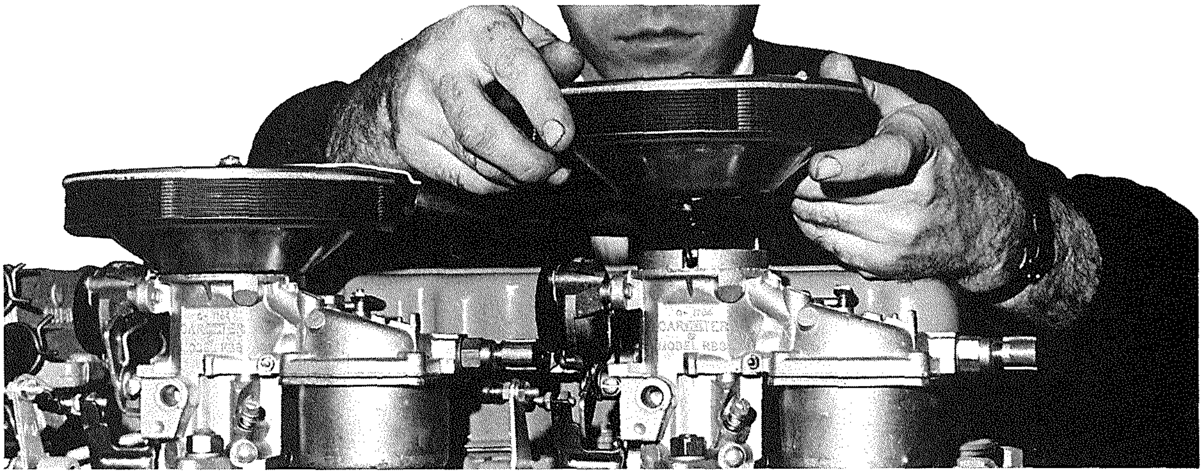
A high-speed miss has its own set of probable causes. One is water in the fuel. Check the filter bowl; you may see water inside. If you don't have a filter bowl, shine a flashlight into the gas tank. A water bubble means trouble, so dump the bad mixture.

water in the cylinder

If missing is caused by an exhaust leak through a cracked exhaust cover or baffle gasket, water will get into the cylinder. This is definitely your problem when you find droplets of condensation on the tips of your sparkplugs.

Another cause of high-speed miss is a poorly grounded magneto or distributor. To check, you'll need a metered series of resistance tests. If you have a distributor setup, check for a loose breaker plate. While the engine runs, put hand pressure on the underside of the plate. If running smooths out, you've found the trouble.

Finally, if the cause of missing hasn't been located, check ignition points for condition and proper gap, run meter tests to check for a weak coil or condenser, examine ignition wiring carefully for breaks and looseness, and check carburetor idle for lean and rich conditions.



FLAME ARRESTORS in your engine's breathing system can load up with dirt and oil. To let the engine run efficiently, they must be kept clean.

Give your stern drive a mid-season lift

By MORT SCHULTZ

▨ YOU SEE IT AT every dock during every boating season. Toward summer's end, when a guy thinks he's got it made, the powerplant fails. Chances are it hasn't had any care since the owner fitted out his rig in the spring.

Gasoline marine engines and outdrives won't perform well for a full boating season without mid-season service. It's the best and easiest way you can prevent annoying inconvenience—and perhaps serious mechanical damage. Here's how:

Start the engine, putting the fuel and cooling systems under pressure, and examine fuel lines and cooling system hoses for leaks. Make sure everything's tight.

Squeeze cooling-system hoses. If they feel mushy, they are deteriorating inside and may not last the rest of the summer. Replace them now.

Bring the engine to normal operating temperature so a maximum of the residue is suspended in the motor oil. If you can get to the drain plug in the bottom of the crankcase, remove it to drain the oil. If not, run the hose of an oil sump pump down through the dipstick tube and pump out the old oil.

Clean or replace the oil filter. Most engines use a cartridge filter that has to be replaced, but some have an element that can be cleaned in kerosene.

Add SE grade motor oil. Its additives protect the engine against rust and scuffing and minimize harmful deposit accumulations. They can cause sticky piston rings and plugging of screens, oil passages, and other engine parts.

SEE ALSO

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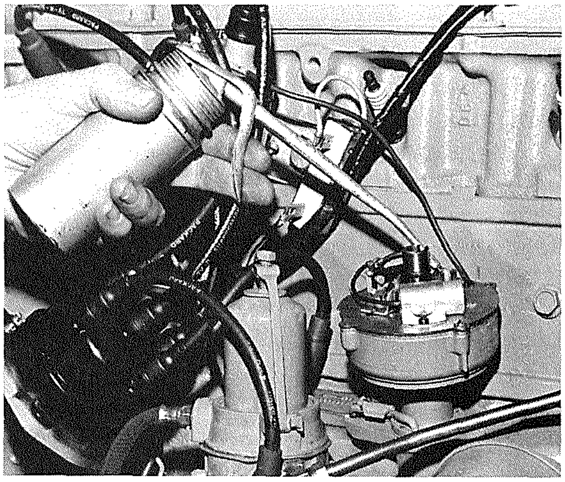
A BIT OF oil on the felt wick slows distributor cam wear and may save a costly replacement.



Remove flame arrestors if your carburetor is so equipped and wash them in mineral spirits. Let them dry thoroughly before reinstalling them. Use new gaskets. Don't tighten arrestors too much; you can compress the element until it acts like a choke in the carburetor.

Close the fuel-line valve to keep gas from pouring out, and clean or replace the fuel filter. Some setups have a sediment bowl-type filter at the fuel pump. To clean it, remove the bowl, take out the filter and wash all elements in gasoline or kerosene.

If you have the type of sediment filter bowl that drops down, prevent gas from spilling into the bilge by loosening the screw holding the bowl and slipping a plastic bag over the bowl. Then remove bag and bowl as a unit.

Other marine engine fuel filters are located between the fuel pump and carburetor. Their paper elements can't be cleaned but must be replaced.

a sticky PCV valve

Some marine engines are equipped with positive crankcase ventilation systems like the one on your car's engine. This must be cleaned to prevent engine blowby, loss of oil and shoddy engine performance.

Pull the PCV valve from the engine valve cover. Start the engine and place a finger over the valve. You should feel strong vacuum. If not, remove the PCV valve from the hose and shake it. It should click. If not, replace the valve.

If the valve does click but there's little vacuum, then there's a blockage in the hose or the carburetor passage. Clean the carburetor or nipple to which the hose connects by hand twirling a drill bit of suitable size (about ¼-in.). If the vacuum is too low, replace the hose.

Most water pumps have sealed ball bearings requiring no lubrication. Similarly, many of today's engines have a.c. generators (alternators) and starter motors with sealed bearings. If you have a d.c. generator and starter motor, you may have provision for oiling. Put three or four drops of SAE 30 engine oil into the oiler.

Remove the distributor cap and rotor. Put about three drops of SAE 10W engine oil on the felt wick atop the breaker cam. Be careful not to get oil on the breaker points. If the points are badly burned or pitted, replace them with a new set.

Check condition of the rotor and distributor cap before returning them to service. Apply about five drops of SAE 10W oil to the distributor housing oil cup if one is there.

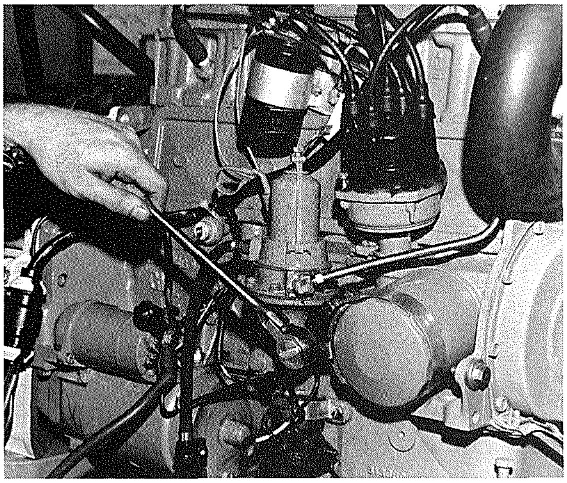
Study secondary wiring and sparkplug boots. Replace any that have cracked or soft insulation.

Pull the sparkplugs. Light tan or gray plugs with unburned electrodes are okay. Carefully clean plug ends with a small wire brush and file the center electrode flat and bright with an ignition point file. Reset the electrode gap by bending the side electrode. Check the gap with a pin-type feeler gauge. The plugs used in most marine engines are set at .030 to .035 inch. Install the plugs finger tight and tighten them half a turn more with a sparkplug wrench.

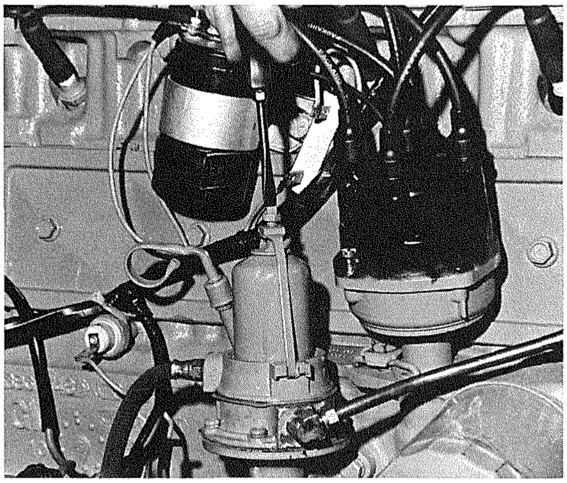
Plugs having carbon on the firing end indicate the engine has been running with an over-rich fuel mixture because of a faulty choke, clogged flame arrestor, improper idle adjustment or dirty carburetor.

A plug that is wet with oil indicates worn valve

USE A STRAP wrench to remove an old oil filter. Then tighten the new one by hand only.



THE FUEL FILTER for this stern-drive is under the fuel pump cover, being removed here.



guides, piston rings, or cylinders. A hotter plug may relieve plug fouling for a time.

Plugs showing burned electrodes and blistered electrode insulators reveal over-advanced ignition timing, a cooling system stoppage, plugs of incorrect heat range, or plugs too loosely installed.

Check drive belts for splits, fraying and tension. If you're really ambitious, go over the entire engine with an engine cleaner. You'll be forgiven, however, if you decide that engine cleaning is a job better suited to off-season work on the boat.

To work on your outdrive, you have to pull the boat out of the water and you'll need a lubrication chart. One's probably in your owner's manual.

lots of drain plugs

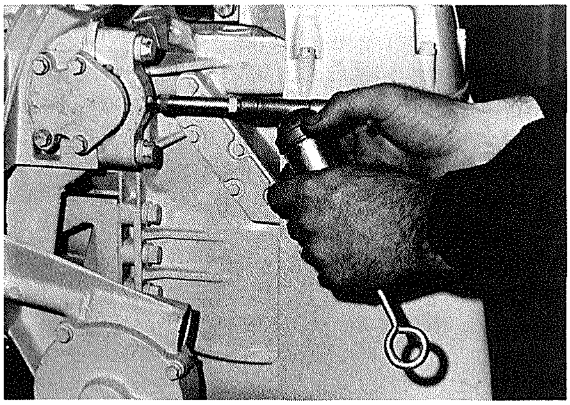
Some units have only one oil drain plug. The unit shown with this article has three separate units to be checked: lower and intermediate units and upper case.

The best time to drain outdrive oil is right after the unit has been run awhile so the lubricant flows readily. Most outdrives require an SAE 90 hypoid gear oil; a few require SAE 10W-30 or SAE 20W-40 motor oil. Check the lube chart.

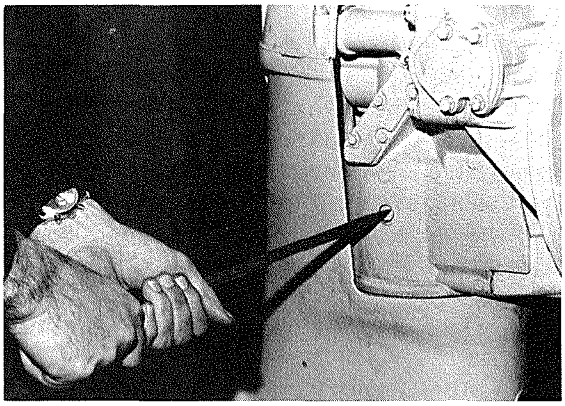
Many outdrives have so-called sacrificial anodes attached to protect paint and housing from the electrolytic action of salt water. At mid-season, salt-water boatmen may well find these are corroded to 50 percent of their original size. That demonstrates that the anode is doing its job—and you wouldn't want to be without one. If yours is down to half-size at mid-season, replace it with a new one.

Remove the propeller for inspection. Trim nicks and burrs with a file, but be careful not to remove more metal than necessary. Check for cracks and bends; if it's badly damaged, replace the prop. Lubricate the prop shaft with an antiseize compound or a waterproof grease before reinstalling the propellor.

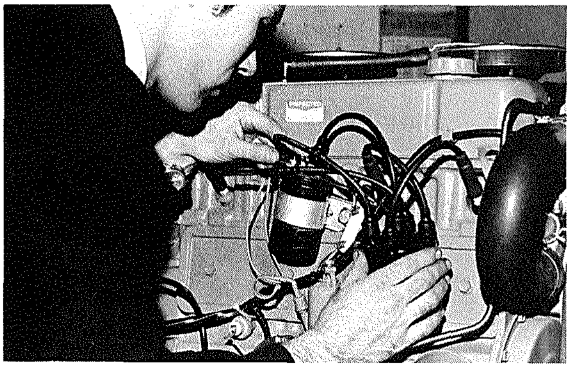
Finally, inspect the entire outdrive's outside closely for paint damage and corrosion. Sand or wire-brush damaged areas to bare metal and apply an antifouling paint containing no copper or mercury. Usually, a matching color is available in an aerosol spray can.



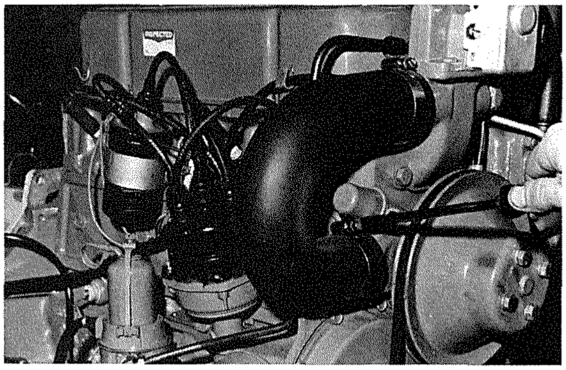
TRUNNIONS on the sides of this unit require midseason lubrication with type "A" lubricant.



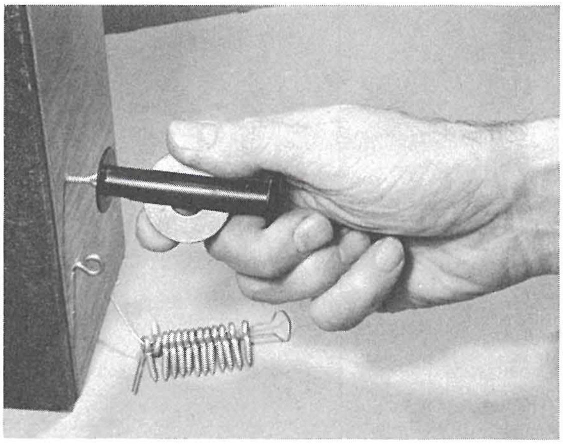
UPPER-CASE drain plug's removal will let oil drain from both the upper case and lower unit.



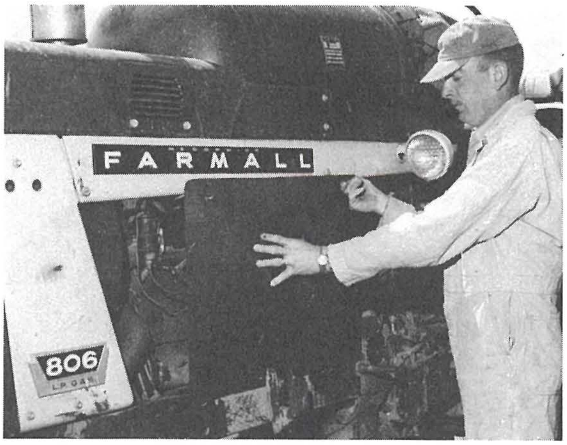
INSPECT all the ignition lines for damage or corrosion. Replace any that aren't in top shape.



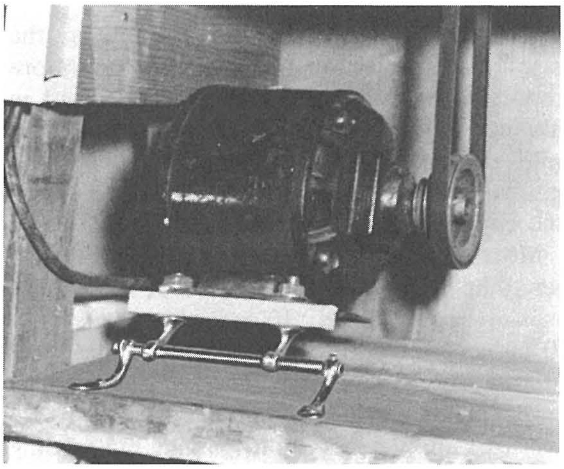
HOSE CONNECTIONS can, in just a few weeks, start working loose. Tightening clamps is good sense.



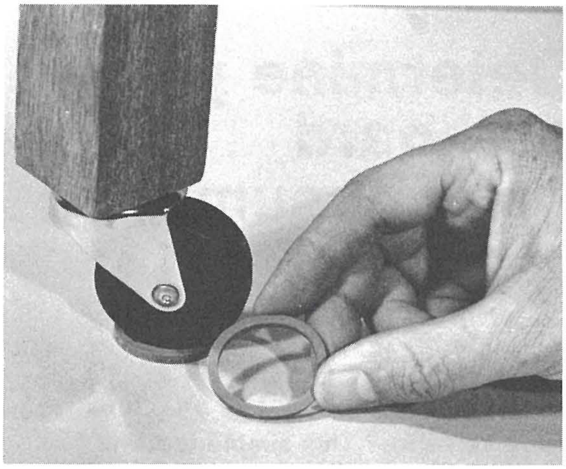
AN EMPTY photographic film spool can be used as a wrench for screw eyes and other flattened items, whose heads will enter the end slot far enough to be firmly gripped. To get better leverage, insert a large washer halfway through the film slot as shown. Though either end of most spools can be used, the 120 size or larger is preferable.—*Walter E. Burton.*



A RADIO mounted on your tractor is good company but noise caused by the ignition system can be annoying. A neighbor of mine discovered that by attaching a metal panel to the tractor, close to the distributor, the interference was stopped. Though it is held firmly in place by a couple of thumbnuts, the panel can be quickly removed and replaced.—*C. F. Marley.*

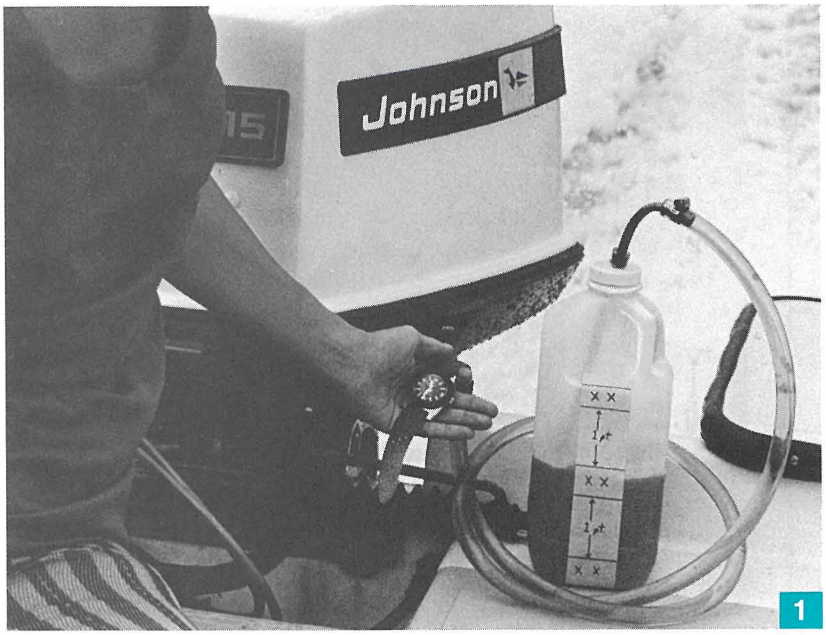


USING THE HARDWARE from an old toilet seat, the motor mount above can be made in an hour. To hold the shaft in place, when sliding the motor for a pulley change, drill and insert a small screw through the bracket and shaft. Use a wood block to raise the motor for proper belt tension and, if necessary, cut off the bolts for motor clearance.—*A. E. Rohmer.*



CASTER-MOUNTED furniture has a tendency to be moved about, especially when there are young children in the home. To make furniture stay where you want it, try slipping a rubber washer under each caster. The assorted-size package of washers sold for plumbing repairs will usually contain several of the sizes that you need.—*Ken Patterson.*

HERE'S AN EASY WAY to drain water from a flat roof. To do it, drill a hole in a short length of 2x4 to accept the male end of a garden hose. Then, place the board in the water, insert the hose and weight the setup with a cement block to keep it in place. Slowly turn the faucet and then detach the hose. Gravity will drain the roof.—*E. G. Hayes.*



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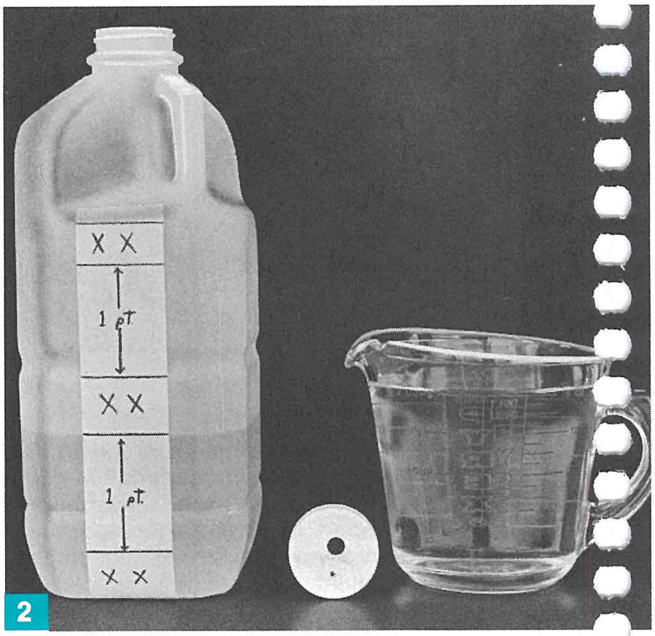


2

Determine your outboard gas consumption

By ROBERT D. STEARNS

How far will your boat go on a tank of gas? Are you sure? This simple test will help you determine the proper figure for your boat and tank

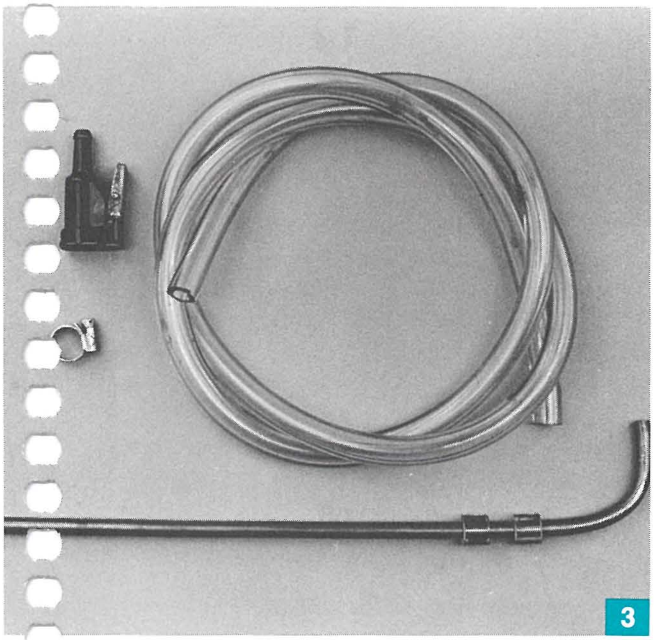
SEE ALSO

Boat repair . . . Boat testing . . . Boating . . . Propellers, boat

■ FUEL SHORTAGES make knowing the gasoline consumption of your outboard more important than ever. If you can figure out in advance your most efficient cruising speed, miles per gallon and range of action on a tank of gas, you're sure to increase your boating safety and enjoyment.

Most large outboards burn about one gallon per 10 hp per hour at full throttle. A 100-hp mill uses up approximately 10 gph wide open, but a 10 percent reduction in rpm can cut gas consumption by 20 percent, while an 80 percent drop in rpm may mean a 35 percent gas saving. These averages apply generally to planing hulls riding over, rather than through, the water, but they can vary greatly from boat to boat with different-size motors and loads. It's certainly worth the small amount of time and expense, using the method shown here, to determine what your fuel requirements really are. Almost any outboard with separate fuel tank can be tested; with adaptations the system should also work for inboards.

Total cost is only about $4 in parts. Assemble a fuel-line connector for your make of engine, a small stainless-steel hose clamp, three feet of 5/16-inch i.d. clear vinyl tubing and enough 5/16 o.d. copper tubing to reach the bottom of your measuring container with a couple inches to spare. For our use, vinyl tubing is better than



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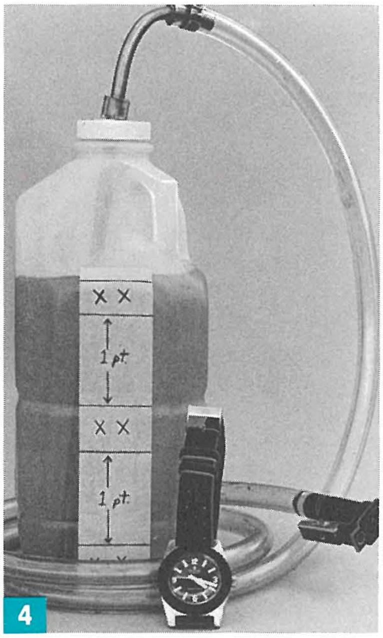

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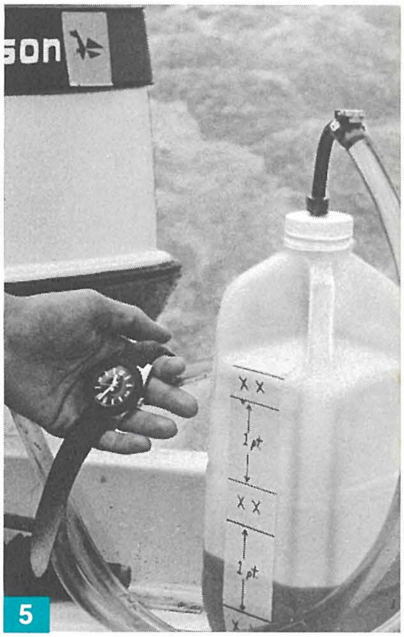


5

1. THIS INEXPENSIVE JUG and tubing rig, plus a wristwatch are the only requirements for this simple fuel-consumption test for outboards.

2. A PLASTIC QUART or half-gallon milk bottle, top and kitchen measuring cup are often already available. A strip of tape makes marking easier.

3. BUY A LENGTH of 5/16-inch outside diameter (o.d.) copper tube, three feet of 5/16-inch i.d. vinyl tube, stainless-steel hose clamp and fuel line connector.

4. A COPPER TUBE to the bottom of the jug fits through a large hole in the top. Add a small hole to serve as an air vent to let the tank "breathe."

5. BURN GAS from the one-inch separation marks between the pints to get the boat on plane and running smoothly before starting to take the time.

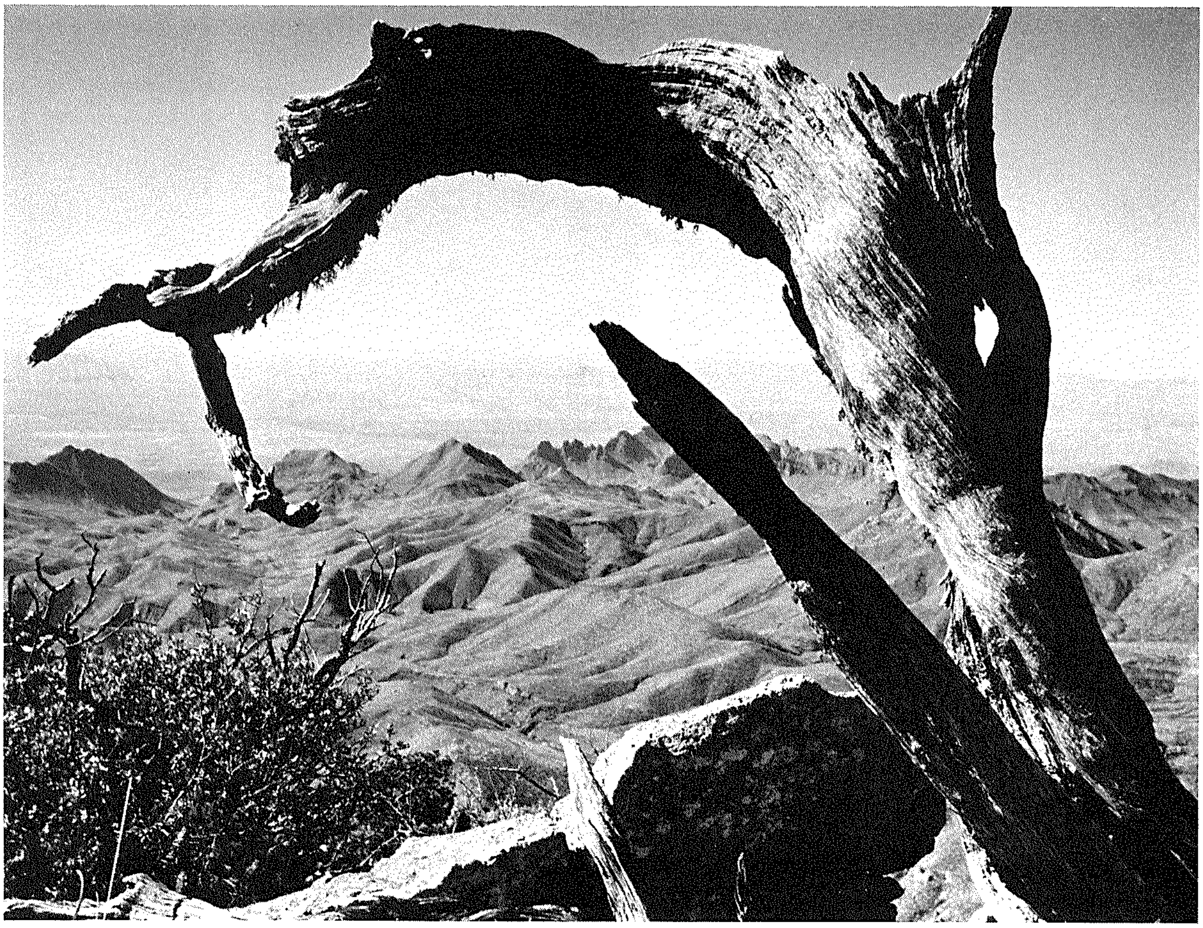
rubber (other than neoprene) since gasoline will not cause vinyl to deteriorate, and its transparency allows monitoring a bubble-free flow of gas. An ideal fuel container is a discarded semi-transparent plastic or half-gallon milk jug. Glass would work, but there is the hazard of breakage in a bouncing boat.

First, apply a strip of masking tape vertically on your jug. You will make your calibration marks on it. Marking directly on the jug with a felt-tip pen didn't work well when I tried it; gasoline made the markings run. To calibrate the jug, first pour in an inch of water and draw a line on the tape at that level. Next add one pint of water using a kitchen measuring cup (two eight-ounce cups equal one pint), and draw another line. With a half-gallon jug you can add and mark another inch of water, measure in another pint, and top it off with one more one-inch marking.

The inch separations between pints are important since they allow getting the boat up on plane and running steadily before timing starts. The bottom inch makes it unnecessary to run the engine dry, and avoids the chance of getting extra miles from fuel in your lines and carburetor. Once your jug is calibrated, dump your measuring water, rinse with gas and then fill with your fuel mix on the dock to avoid the chance of spilled gas and vapor aboard.

Test runs are easy. Find a calm water area for easier reading of your jug markings and, preferably, with buoys or markers spaced a known distance apart, if you don't have a boat speedometer. Use up your extra inch of gas, once you're plugged into your engine, to get settled on a smooth run and then time your run while burning one pint.

The arithmetic is simple. A pint is ⅛th of a gallon so by multiplying your pint time by eight you have your time for burning one gallon. Divide that figure into 60 for gallons per hour. Let's say you use one pint in two minutes. Two times eight is 16, and 60 divided by 16 is 3.75. Your engine is burning 3.75 gallons per hour at that throttle setting. For an even easier way, divide your time for one pint into 7.5 (which is 60 divided by eight) and you get the results in one step.



THE LONG shadows of sunrise and sunset bring out details that likely would fall flat if photographed in the light of mid-day as in these desert badlands.

How to get great outdoor pictures

By E. P. HADDON

A professional wildlife photographer tells his secrets. It takes the right equipment, but even more important are the correct exposure, framing, composition and patience to get the perfect shot

SEE ALSO

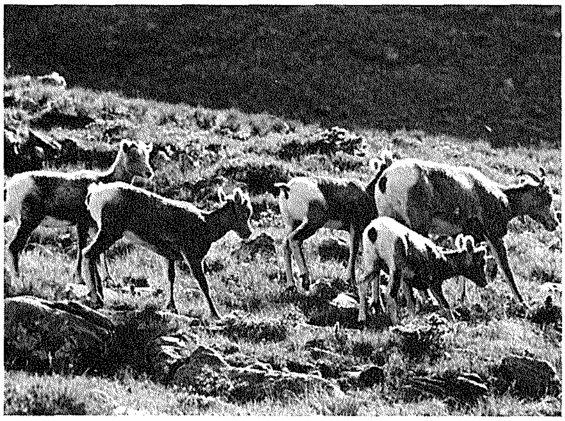
Bird photos . . . Boating photography . . .
Night photography . . . Panorama photos . . .
Photo hints . . . Photography . . .
Portrait photography . . . Telephotos . . .
Underwater photos

■ FOR THE SPORTSMAN, outdoor photography is a hobby within a hobby. And it's a hobby you can master with nothing more than a small camera that fits in your shirt pocket, plus some knowledge of and attention to simple techniques.

The basic requirement is a good camera that's easy to tote—but even the least expensive Instamatic can give good results if it's used properly. And even heavy telephoto outfits are totable on long hikes: Just transfer the camera's weight to your pack frame with two belt hooks and some nylon tape.

Good pictures start with good framing and composition. An effective picture has good balance, it is pleasing to the eye and it contains no unnecessary distractions.

Low camera positions are a helpful compositional trick many photographers ignore. Shoot-

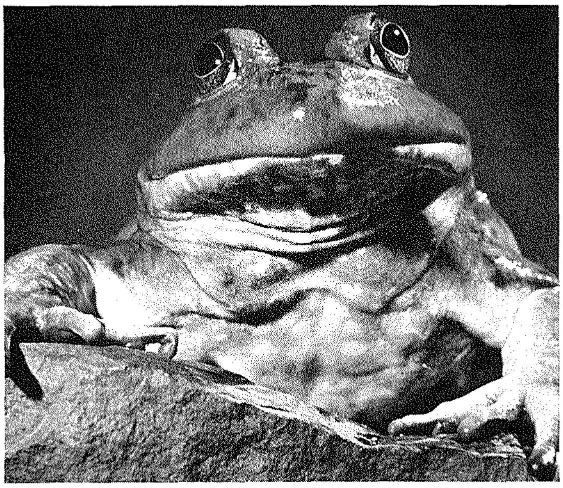


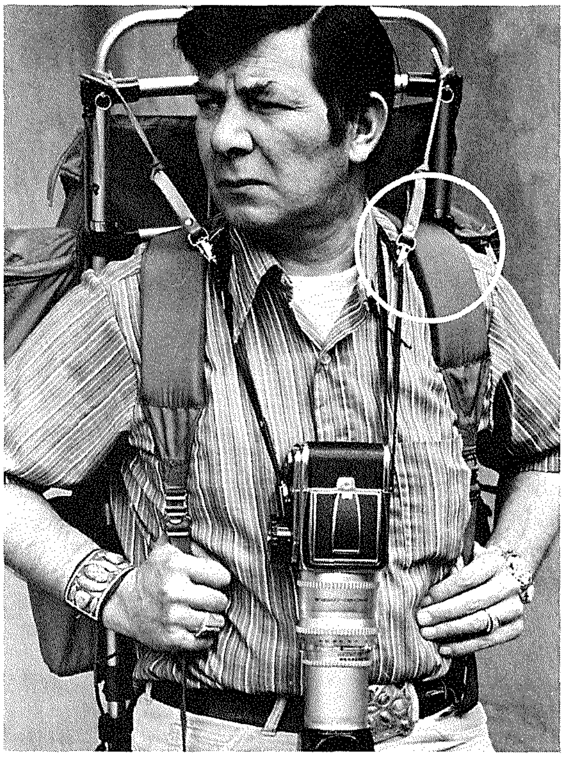
BACKLIGHTING IS most effective in an open meadow, snow-covered landscape, or on the beach. This proves to be especially true when there is some wildlife around to cast extra shadows for added effect.

ing upward from a low angle, you can dramatize subjects by making them look taller and by emphasizing the texture of the foreground. And aiming upward to shoot your subject against the sky eliminates much background clutter.

To make the sky more interesting, clouds can be emphasized with filters: For black and white, you can use yellow, orange or red filters for increasingly dramatic (and decreasingly natural) effects; with color, you can use only a polarizing filter, which darkens that portion of the sky at a right angle to the sun, and which also can be used with black and white film. When shooting distant scenics, or whenever shooting color at altitudes above 5000 feet, you should use skylight or haze filters to eliminate excess blue. Shooting bighorn in the Sangre de Cristo mountains, two miles above sea level, I find my shots look sick without such filters.

A SPOTLIGHT held this frog fascinated while we shot from 3 feet away with a 90-mm tele. Flash on camera was augmented by slave flash held by a friend.





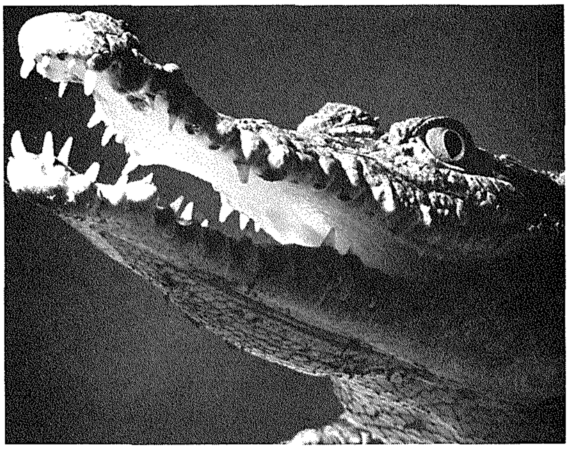
TRANSFER YOUR camera's weight from your neck to your packframe when backpacking, to make it easier to hike for days. The author uses nylon tape and a couple of hooks for support (circle).

Focusing also affects your background. If it's cluttered and unattractive, use a wide-open lens to throw it out of focus. But for general scenics or action whose exact distance you can't foresee, use the smallest lens opening that permits an adequate shutter speed, to keep the greatest possible range of distances in focus; and use your lens' depth-of-field scale (most non-automatic cameras have one) to place that depth where it will be most useful.

The subject's angle to the camera is also important. Animals and people are best shot facing the camera, and action is best shot moving into or across the picture, not out of it—basically a matter of aiming the camera a bit ahead of the action.

Action that's moving toward the camera is also easier to stop than action moving across the camera's field of view. A deer coming head-on at full-speed might be stopped with a shutter setting of 1/500 second; but running broadside across the camera's field close by, he might need 1/1000.

Where you expect to be shooting action in subdued light (or where you'll need fast shutter speeds to reduce the effects of tele lens shake)



AUTHOR HID, flash at the ready, by a log where a crocodile was likely to climb. Author's patience really paid off with this shot. He used a flash off the camera on a 5-foot cord to catch the drama of the eye and teeth. This was the correct sidelighting.

DEADLY COTTONMOUTH moccasin was shot from 20 inches with a 90-mm lens and close-up attachment. Fortunately, he couldn't strike as he was not coiled. Notice the way the tongue is stopped with electronic flash.

use a fast film such as High Speed Ektachrome for slides, or Tri-X for black-and-white prints. But slower films, such as Plus-X black and white, Ektachrome and Kodachrome for color slides, and Kodacolor for color prints will give you finer detail.

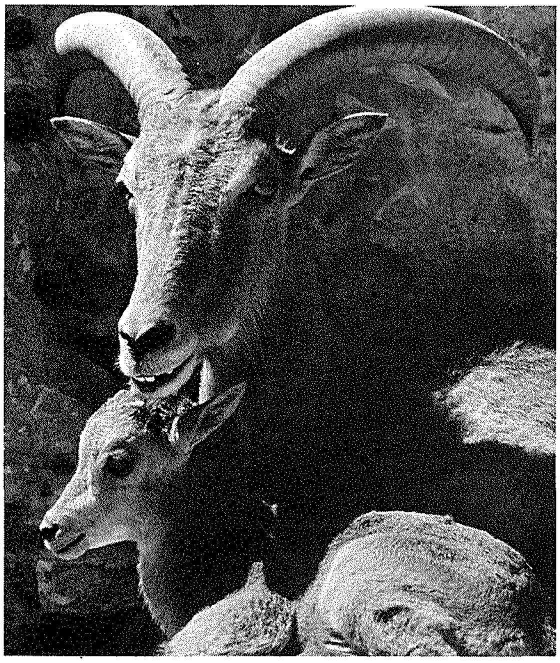
A faster film also helps you shoot on overcast or rainy days, when colors are soft and greens especially vivid. When the sun is out, try to shoot in the early morning and afternoon when the light is most dramatic and long shadows accentuate landscapes and the animals that move across them. Early light is especially good for features of distant mountains that fall flat at high noon. If you find sunset or sunrise light too red, you can cool it down a bit with an 92A filter; if you want to accentuate the redness, try a Sky 1A or Haze.

BIRD PHOTOGRAPHY takes patience. It is best to hide where birds nest, feed or gather. Blinds are necessary for close-ups of waterfowl and other nervous birds. This prairie falcon was snapped from hiding, with a 180-mm telephoto lens held ready for the right moment.

Noon, oddly enough, is a good time for flash. Use it to fill in the shadows under noses and hat brims. When the sun is lower, flash fill-in lets you face subjects away from the sun, for more relaxed, squint-free expressions; properly done, such backlighting is more dramatic, too. Fill-in is also good with sidelighting. The technique of fill-in flash is basically a matter of juggling flash and sunlight exposure so the subject gets its main exposure from the sun and a bit less exposure from the flash.

Flash is about your only choice when shooting game at night. The flash is too quick to scare the game, and it stops action beautifully. Nighttime flash shots do have an artificial look, with dark backgrounds, washed-out foregrounds and red eyes. But you can eliminate the red eyes and get more natural lighting by using a long flashcord and holding your flash off the camera. You can attach the flash to an overhanging tree limb with a camera clamp.

Electronic flash beats bulb flash on the trail. A pocket-sized flash can give you as many as 150 shots or more on two sets of alkaline AA batteries (more batteries are easy to bring along), and there are no used bulbs to be carted back or



BARBARY SHEEP, among the wariest of big game, are hard to stalk. These were shot from a hiding place across the canyon, with a 500-mm telephoto lens on a 2¼ x 2¼ single-lens reflex camera. Telephotos are among the most useful lenses for wildlife.

to litter up the trail.

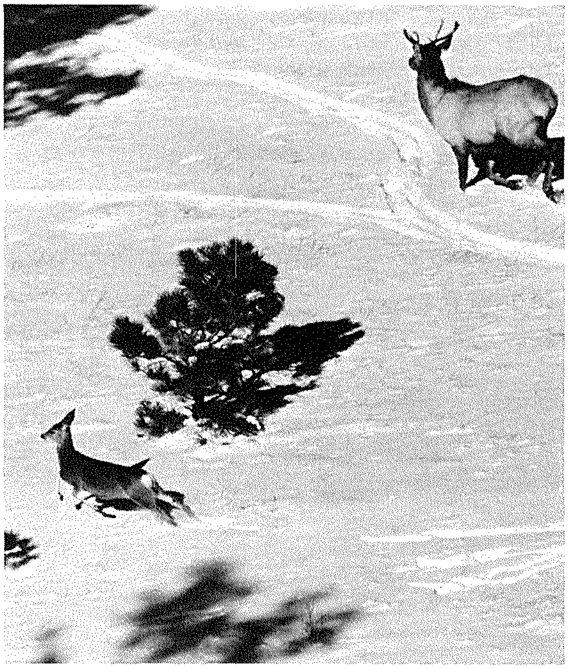
Both electronic flash and cameras can be damaged by moisture. So take plenty of plastic bags to protect them from rain. You can even shoot single-lens reflex cameras while they're in a bag: Just cut holes for the lens and eyepiece, and clamp the edge of the bag to the lens with a lens hood.

If you're going to expose your camera regularly to heavy rains, snow, salt spray or canoe upsets, the Nikonos is tops. Sealed for underwater use, it also makes a great all-weather camera.

Whatever game you're stalking with a camera, you need the same tricks hunters use. Cling to the shadows, keep upwind from easily spooked game, walk slowly with a light tread, and anticipate what lies ahead. Preset your shutter speed and lens opening for existing conditions (automatic, electric-eye cameras do this for you) so you'll have nothing to do when an animal appears but aim, focus and shoot. If you're lying in wait at a water hole, salt lick or wherever the animal's location is predictable, you can save even more time by prefocusing where you expect to see him.

The right equipment does make a difference in wildlife photography. A camera clamp is among the most useful pieces of gear, holding the camera so you can set a self-timer and get in the picture yourself, steadying it for time exposures, or holding a flashgun away from the camera. Add a long rubber-bulb or cable release and a camouflage poncho, and you're equipped to shoot birds in their nests. For close-ups of plants, insects and trout flies, use a single-lens reflex camera with auxiliary close-up lenses or extension tubes. With a polarizing filter, to cut through water-top reflections, you can even shoot a

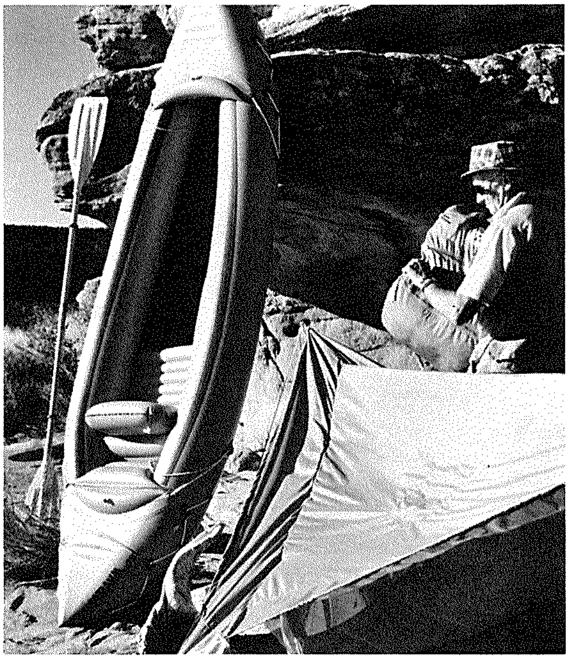
USING TREES for concealment, the author shot this elk herd storming past. For such head-on action, 1/500 second is fast-enough. But broadside close-ups taken just as the elk moved past the camera required a faster shutter speed, 1/1000 second.



SNOW AND BEACHES can fool exposure meters. To solve this problem try taking a reading from your gloved hand. Another solution is to carefully follow the recommendations on your film's instruction sheet.

90-MM MEDIUM tele knit together this carefully planned shot of a falconer and his dog bringing the distant peaks into greater prominence.

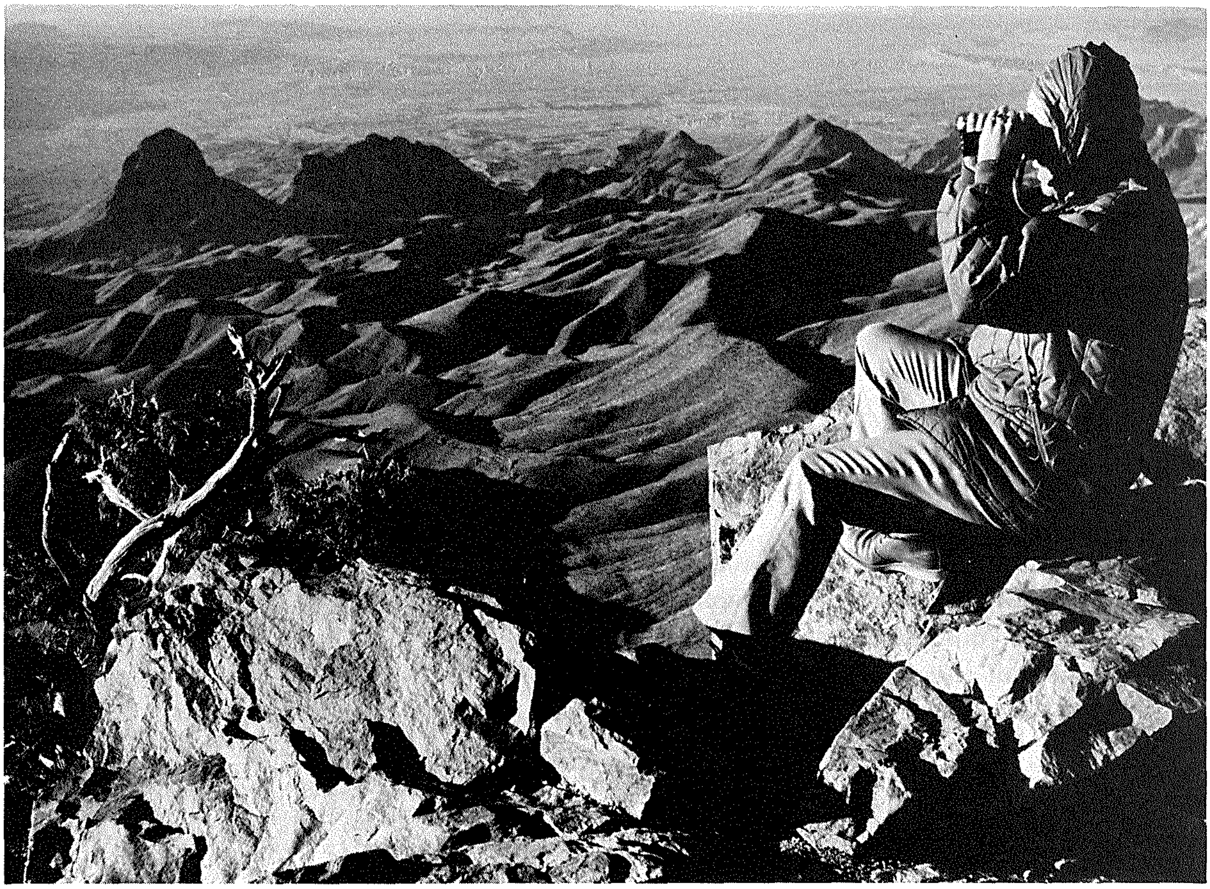
CAMP SCENES are a must for good thorough coverage of your pack trip. Here, the low morning light is used to bring out considerable detail in the light-colored sand, tent, and the inflatable kayak.



close-up portrait of a feeding fish. And reflex cameras are great with long telephoto lenses, so you can photograph wary wildlife.

Since telephotos magnify camera shake, it pays to learn some rifleman's tricks, too: Squeeze off your shots as slowly with a camera as you would with a rifle. Steady your camera by bracing your arms against trees, rocks or fences, or drop into a rifleman's crouch. "Gunstock" mounts, many of which can be folded up compactly, also help.

On the other hand, you can travel light and still get good pictures. I often take along the 15-ounce Rollei 35, a full-frame 35-mm camera that features a brilliant viewfinder, a built-in exposure meter, shutter speeds from ½ to 1/500 second, and a 40-mm Tessar f/3.5 lens that folds in for compact carrying. My whole Rollei outfit, complete with lens hood, filters, Rollei electronic flash and film, can be carried in a jacket pocket or a small Camp Trails belt pouch. Similar, but less expensive (and a bit less compact), cameras are available from Fujica, Konica, Minolta,



WITH SELF-TIMER and pocket-sized camera clamp, you can become a part of your own picture. For this shot, a wide-angle lens caught the depth of field.

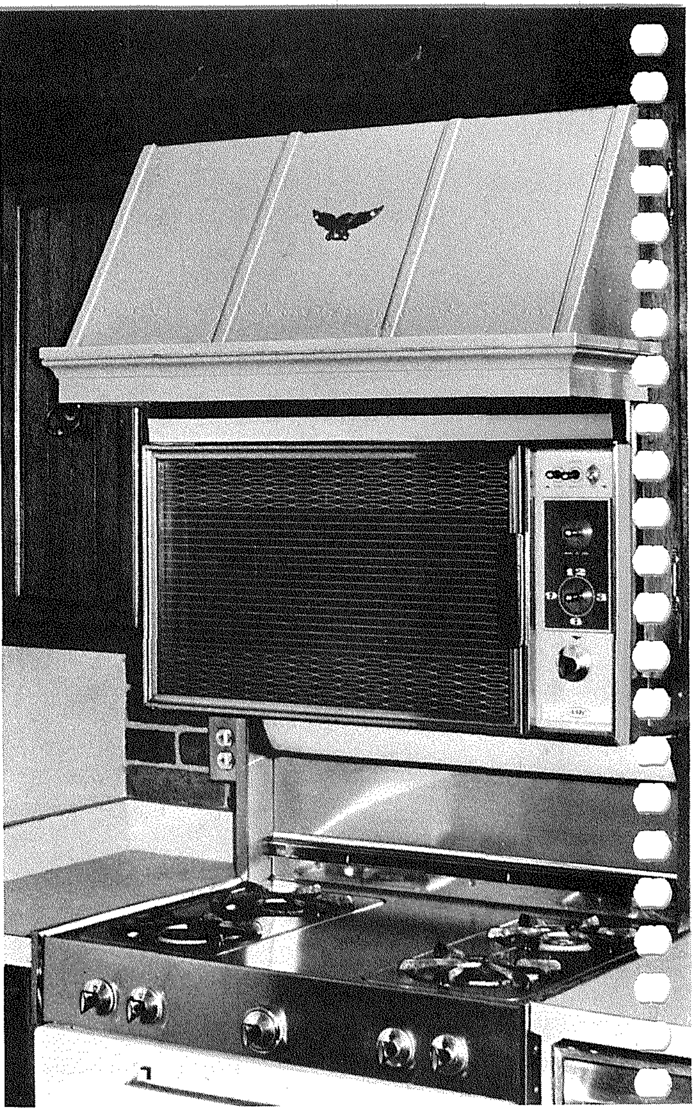
Olympus, Petri and Yashica, many with coupled rangefinders and most with automatic exposure control. Many outdoor photographers swear by the rugged, compact old Leicas which, unlike other compacts, take interchangeable telephoto and wide-angle lenses.

Simple cameras, which are usually even lighter and easier to carry, can also yield good shots, of course (I've seen some nice results from Pocket Instamatics).

At the other extreme, 2¼ x 2¼ cameras, such as the Hasselblad single-lens reflex, the Mamiya interchangeable-lens twin-lens reflex (especially the current models, which are lighter than the old ones) and the light, rugged Rolleiflex, are also used on the trail for the greater detail and tonal range their larger negatives provide. Some really dedicated nature photographers even pack 4x5 view cameras!

But whatever your camera, it's not the equipment but the thought and care you put into your shooting that make your picture trophies true records of the drama and beauty of your trips.

TRIPOD STRAPS easily to the "Expedition" pack. When an ice ax is carried, the tripod can be strapped to the top of the pack frame. This Vivitar tripod will add less than five pounds to your load.



How to build a hood for an oven-over range

By ALFRED OSBORNE

Covering an exhaust fan in the wall, this hood will direct the heat, cooking odors and vapors out of your kitchen. It is made from sheet metal and wood trim

■ WHEN WE INSTALLED a wall oven over our kitchen range and hung it between two hanging cabinets, we couldn't find a hood with an exhaust fan that would fit between the cabinets. They were either too wide or too narrow. That's when I decided to make this attractive colonial hood which fits the space between the soffit and the top of the oven and the two flanking cabinets.

I bought and installed an exhaust fan in the wall over the oven, venting it to the outside and wiring it to a switch conveniently located under the cabinets. The fan not only exhausted the heat from the oven but also the cooking odors and grease-laden vapors from the range as well. Removable filters were used to trap the grease.

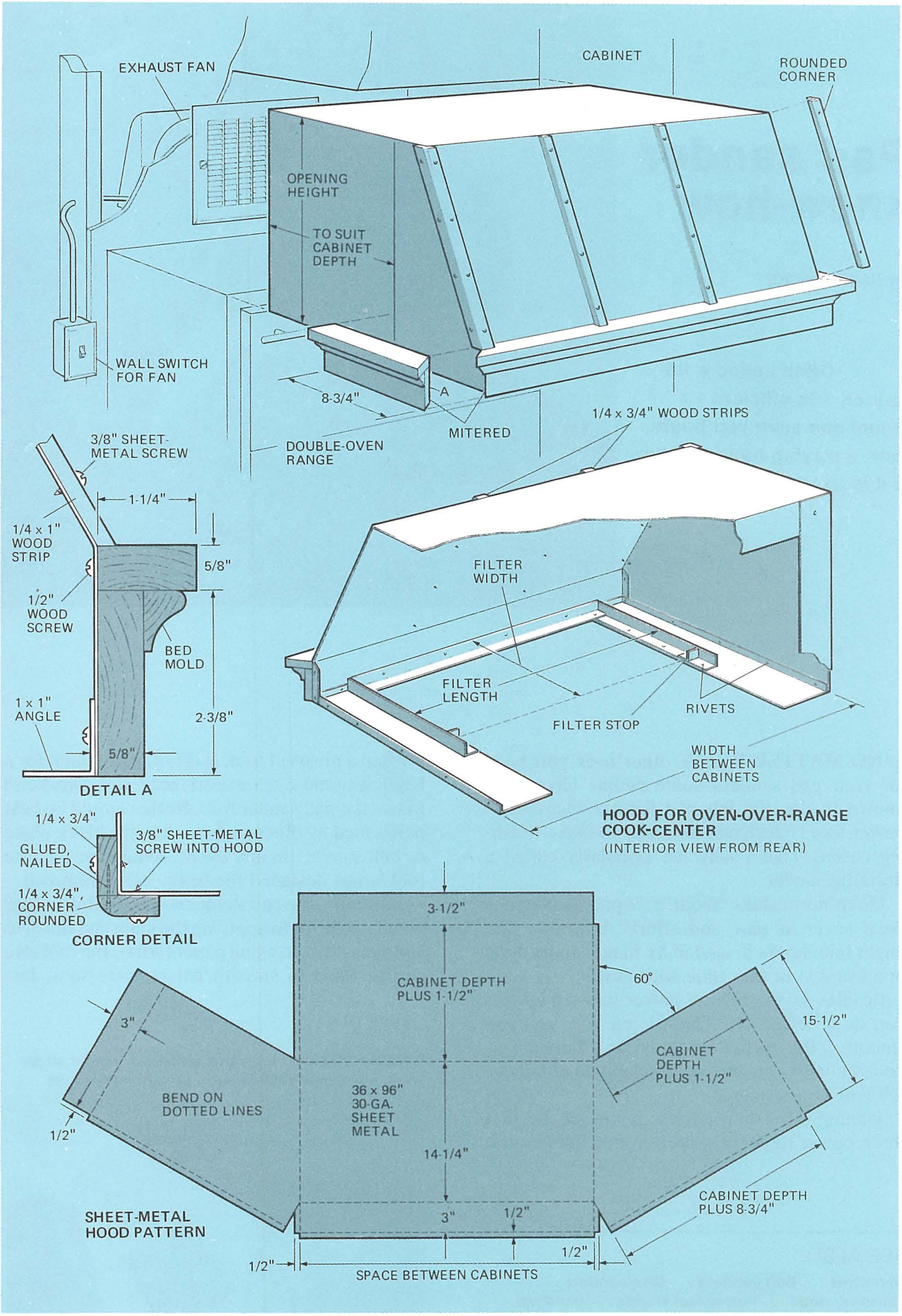
I formed the hood from a 36x94-in. sheet of 30-ga. sheet metal, cutting it according to the pattern. Most of the bends are made 90° to form flanges. The exceptions are those along the bottom edges which are bent 180° and hammered flat to stiffen the metal. I used Pop rivets to join the sides to the top. A neat job of bending results from using two straight pieces of wood and clamping them to each side of the metal along the line of bend.

The built-up, 3-in.-wide wood trim along the sides and front of the hood is made in one piece as shown in detail A, then mitered at the corners to fit. The corner trim pieces are preassembled similarly, then cut to fit and attached to the hood with sheet-metal screws. Finally, I Pop-riveted 1x1-in. metal angles to the bottom hood flanges to hold removable grease filters. The corner strips, as well as the strips applied to the face of the hood, not only add decoration, but they actually serve to stiffen the hood.

The finished hood can be spray-painted a complementary color, or covered with the same wallpaper pattern as may be used in the kitchen. In the latter case, it would be best to apply the paper before adding the decorative wood strips. For a bit of Early American decor, I added a brass eagle as a final touch.

SEE ALSO

Appliance centers . . . Kitchen accessories . . . Kitchens . . . Ranges



DETAIL A

CORNER DETAIL

HOOD FOR OVEN-OVER-RANGE COOK-CENTER

(INTERIOR VIEW FROM REAR)

SHEET-METAL HOOD PATTERN

Pad sander know-how

By HARRY WICKS

Often called a finishing sander, this efficient power tool can save you hours of arm-wearying hand sanding if it is used correctly

■ NO MATTER WHAT other uses you have for your pad sander—some people have been known to use the felt pad for massages—this power tool is designed basically to make finishing easier. That's why it's popularly called a finishing sander.

Make no mistake about it, a pad sander is a great saver of time and effort. A project that might take hours if sanded by hand can be done in a fraction of that time with power.

Besides saving time, a power pad sander lets you do a better job. There is no way you can smooth a flat surface by hand as efficiently as you can with abrasive paper clamped about the felt pad of a sander.

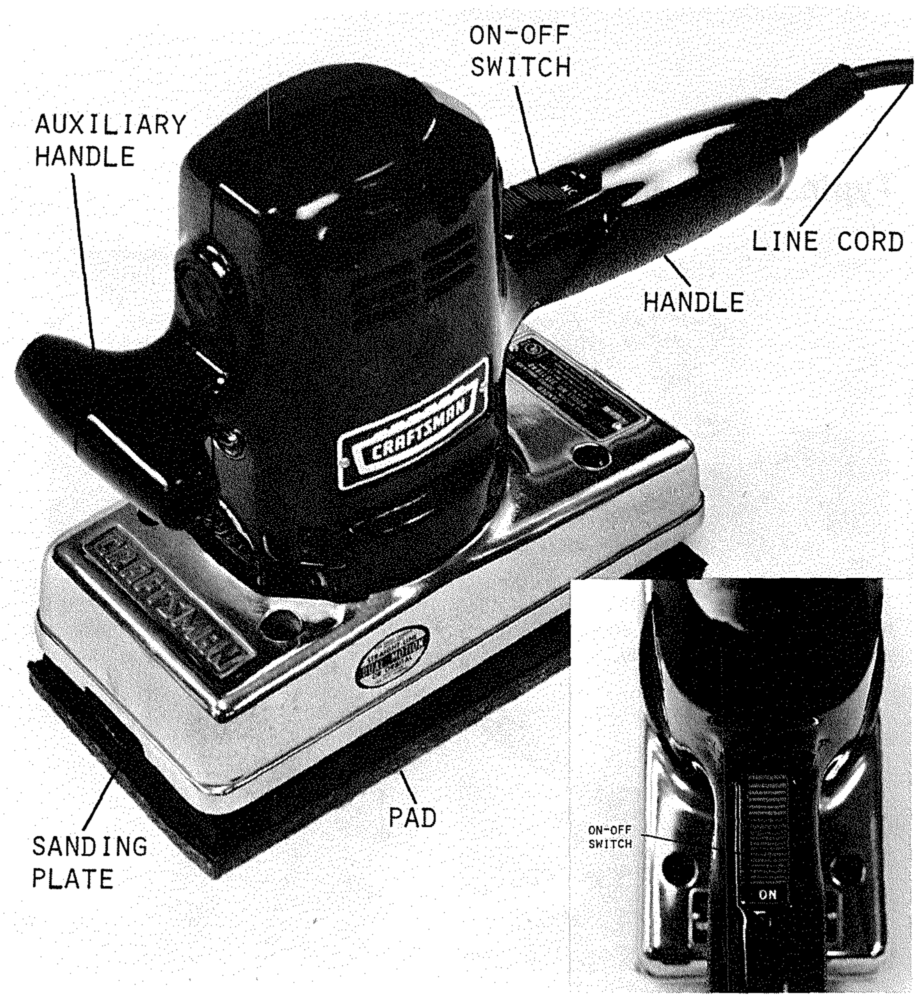
Though a finishing sander is one of the first three power tools most do-it-yourselfers buy, it is often a misused tool. It is not uncommon for a beginner (and even experienced woodworkers) to use the pad sander for jobs that would be best performed by other tools such as the block plane or belt sander. In any evént, remember that the tool is not designed for heavy stock removal.

Basically, the pad sander is used to finish-sand wood just prior to applying the stain and finish to a project. By changing paper (grits), the tool also can be used to smooth paints, varnishes, lac-

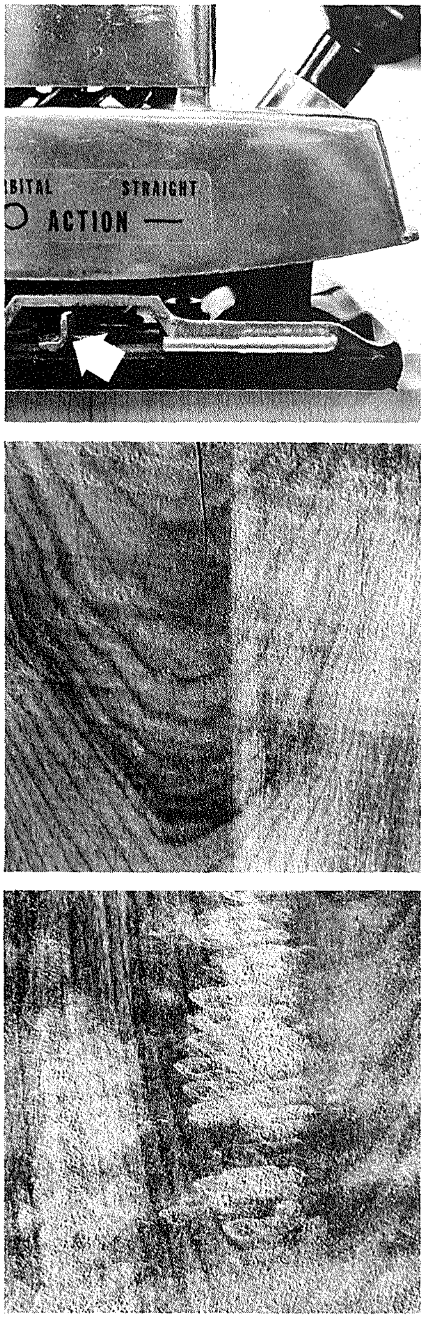
SEE ALSO

Abrasives . . . Belt sanders . . . Disc sanders . . . Finishes, wood . . . Power-tool stands . . . Sanding

PAPERS SIZED to suit various makers' sander shoes come packaged in all-one-grit or with mixed grits.



Dual-action sanders



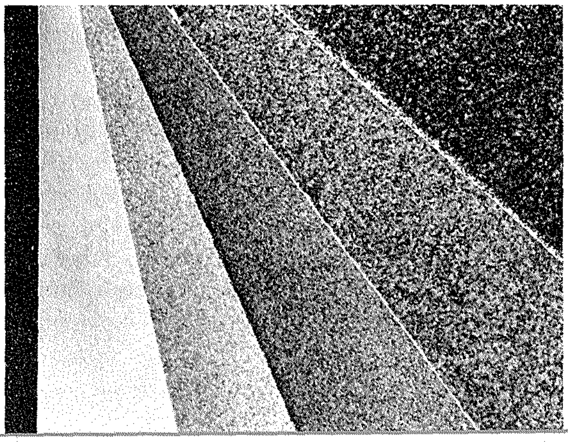
DIFFERENT MANUFACTURERS use various kinds of on-off switches. Sears model shown above has a thumb-operated slide type (inset) instead of toggle switch. A two-way sander (top right) gives you a choice between straight-line (center photo) and orbital sanding (bottom photo).

quers and the like between coats. Finally, when fitted with a lamb's-wool pad, a pad sander can be used with polishes and paste waxes to bring furniture to a high luster.

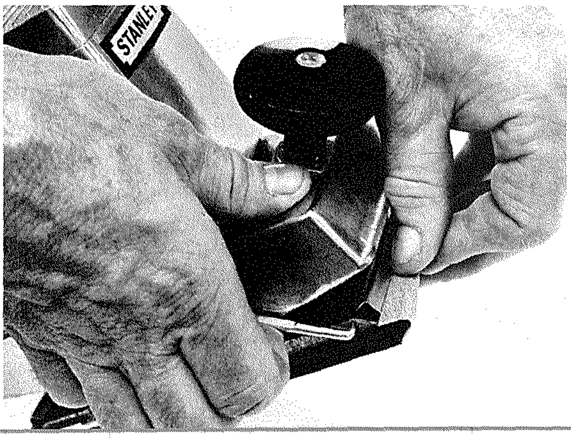
types of pad sanders

There are two types, straight-line and orbital. The former has a back-and-forth motion which makes it ideal for with-the-grain sanding as you get close to the final stages of the sanding opera-

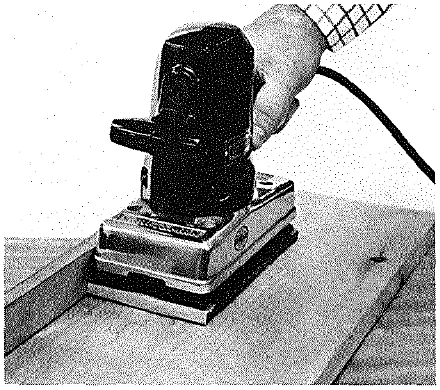
SANDPAPER COMES in a wide variety of grits, from left—wet or dry fine, 280, 120, 100, 80 and 60.



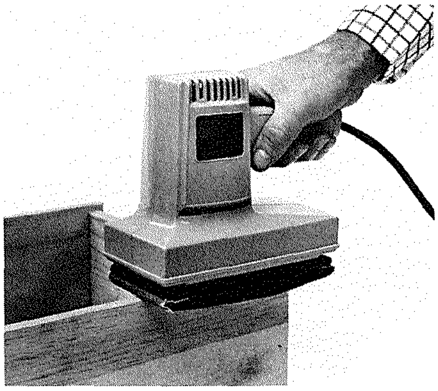
METHOD OF HOLDING sandpaper varies with makers. The author liked this version from Stanley.



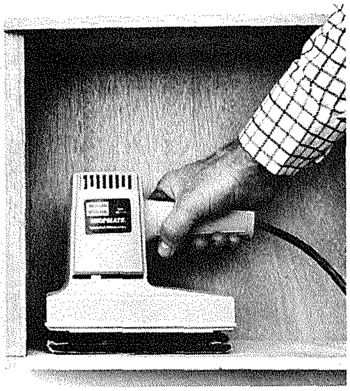
Typical pad-sander chores



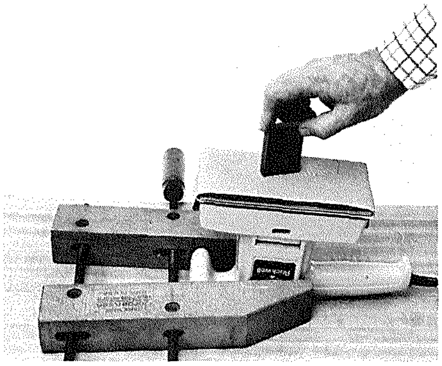
TO SAND corner with minimum chatter, let side of shoe (not end) contact vertical.



NARROW SURFACE can be accurately sanded if you work carefully.

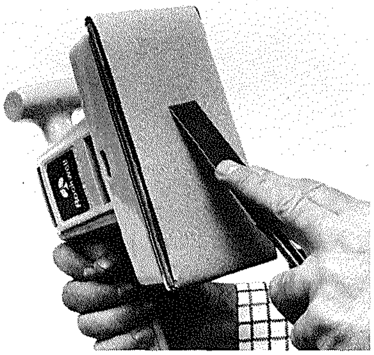


PAD SANDER gets into tight corners; the orbital type usually leaves marks here.



SAND SMALL objects by clamping sander upside down. Don't overtighten the clamp.

FITTED WITH a polishing pad, sander brings paste wax to a smooth, high luster.



WITH CARE and fine emery paper, in a pinch, sander can hone a chisel.

tion. The straight-line action removes stock more slowly than the orbital type, but does a smoother job. On some soft woods, stock removal can be speeded up by sanding across the grain in the early coarse-grit stages.

Orbital sanders, on the other hand, combine a slight side-to-side motion with a back-and-forth motion to form small orbits. If speed is slow, swirls will be obvious on the finished product and mar its beauty.

Both types are readily available, and now most manufacturers offer sander models which combine both actions in one tool.

choosing a pad sander

The pad sander is a simple tool—one which you can learn to use correctly in a short time. Before buying one, the smartest thing you can do is to pick up and heft the various models you are considering. The better hardware and building supply outlets usually have sample boards available for customer tool tests.

By using this service, you will quickly find out that some tools feel extra comfortable in your hand, while others will be just plain cumbersome. Now is the time—before spending—to find out whether or not a tool gives you satisfactory working comfort.

You will also have to decide whether you want straight-line or orbital action or both. Many craftsmen are content with an orbital sander with a high speed and very small orbits. With one of these, it is just about impossible to see any swirl marks in the finished project unless you have super vision (or use a magnifying glass). These models also cost more than their slower, larger-orbiting cousins.

Of course, with coarse-grit paper, almost any orbital sander is certain to produce some swirl marks as shown in the photo on page 2167. Here, a 40-grit paper was used on a piece of birch to demonstrate the look of sander swirls.

If you opt for a dual-action model, make certain that the switch controlling the sander action is easy to use, yet located and operated in such a way as to avoid accidental changing of sanding strokes.

As with all power tools, you get what you pay for in pad sanders. In general, it's safe to say that the higher the price, the better the quality will be: The construction of the tool plus the number and type of bearings definitely affect the sander's price tag.

As a rule of thumb, you can figure that the most inexpensive sanders will serve just fine for the once-in-a-while user. Those equipping a woodworking shop, with the idea of doing most home handyman chores themselves and taking on occasional furniture projects, will usually be content with a tool in the middle price range.

In general, the highest priced pad sanders are geared for the professional market. However, many serious do-it-yourselfers want the best tools; for these, sanders rated commercial or industrial are the only choices.

New on the power-tool scene and something you should think about seriously before buying, as far as I'm concerned, are the short, pigtail-like line cords which now come on many new tools—including sanders.

On these, the line cord measures a mere foot or so instead of the traditional 6 to 8 ft. The reason for shorter cords is both obvious and understandable. The cords are made of copper. When less of it is used, retail prices can be kept down. For my money however, I find the resulting inconvenience an expensive price to pay.

mounting paper

There are as many different ways of putting sandpaper in a pad sander as there are pad sanders. Some tools are easy to load and some are not. Check this feature before buying and pick a sander that makes it easy to mount and remove papers.

No matter how paper is mounted and held, it must remain flat as well as secure. The action of the sander itself is a pulling one, and if the paper is loose and flaps about, it will soon tear and become useless.

Check the maker's instructions for mounting papers and make certain that all papers you mount are stretched tightly across the pad.

The shoe (or pad) on most sanders is sized so you will be able to get three strips of paper from a standard-size sheet of abrasive paper. Some of the commercial-duty sanders have larger shoes; with these you get two sander-size pieces from each sheet. Sized sandpapers are also available as accessories: These are packaged both in assorted grits and in all-one-type papers, as shown on page 2166.

maintaining the sander

No matter what price tool you buy, it will last longer if you use and maintain it properly. Pad sander maintenance, for the most part, consists of little more than keeping the air ports free of dust accumulation (so the tool won't overheat) and periodic lubrication. The best way to do the former is by blowing out the tool with compressed air. If you lack a compressor, periodically take your sander to the local gas station to blow out all dust. If you do own a compressor, use it on the sander after every work session. Lubricate the tool following the manufacturer's instructions with regard to points, frequency and type of lubricant to use. Today, many sanders are sealed and require no further lubrication by the owner. But since that's not the case for all sanders, carefully read that section of the manual covering lubrication.

using the tool

No matter which type of pad sander you buy, it will come equipped with a felt pad on its shoe. The rigidity—or degree of softness—of this pad is intended to suit most of the average jobs a do-it-yourselfer encounters. However, on occasion a softer or harder pad is required.

For example, on some plastics, woods with hard-and-soft grains and for honing of chisels, a more-rigid pad is desirable. In this event, you simply place a piece of ⅛-in. hardboard between the paper and felt pad. To hold it in place, drive three or four brads through the hardboard and into the felt.

If the occasion demands a softer pad, try substituting foam rubber for the felt pad.

Some sanders come equipped with an auxiliary handle. On certain jobs, such as for vertical sanding, this can be very handy. A spare handle is often useful on the bench, too, because two-hand operation will assist you in keeping the shoe flat on the workpiece.

No matter which action your sander has—orbital or straight-line—it is usually best to work the tool back and forth parallel with the grain of the wood.

When edge sanding a narrow surface, use both hands to maintain maximum control. If the job is a critical one, clamp boards on both sides of the surface being sanded to prevent any chance of rounding over corners.

Mount your sander in a stand

By WALTER E. BURTON

This easy-to-make stand will anchor your sander firmly to let you sand small pieces at whatever angle you find most convenient. You can design it to fit any model sander

SEE ALSO

Abrasives . . . Belt sanders . . . Disc sanders . . . Finishes, wood . . . Motors, shop . . . Power-tool stands . . . Sanding

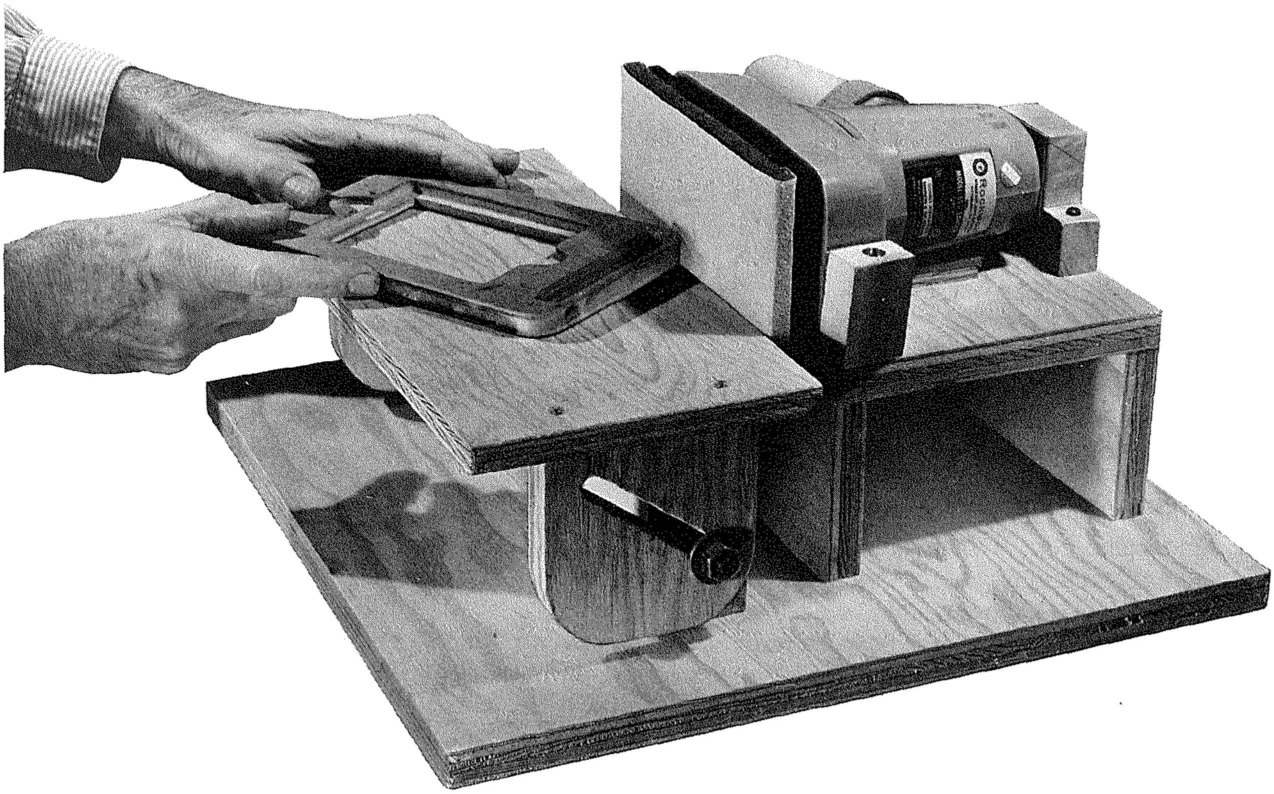
■ EVER TRY TO SAND a 1-in. wood cube with a portable finishing sander? If you have, you probably wished you had the sander firmly anchored so you could manipulate the cube instead of the machine.

The wood stand shown here provides a firm mounting for a finishing sander and a convenient means of guiding small pieces, such as model parts, against its vibrating abrasive surface. The stand was designed to fit a Rockwell sander; other makes of machines can be used, of course, although the arrangement of the mounting blocks and other elements might require some altering.

The work-supporting table is of ½-in. plywood; almost all other parts are from ¾-in. plywood. I used ordinary ¾-in. pine lumber for the table column.

The sander platform was constructed first and mounted on the base with its outer longitudinal margin 1 in. from the base edge. The two vertical pieces were attached to the horizontal panel with glue and nails.

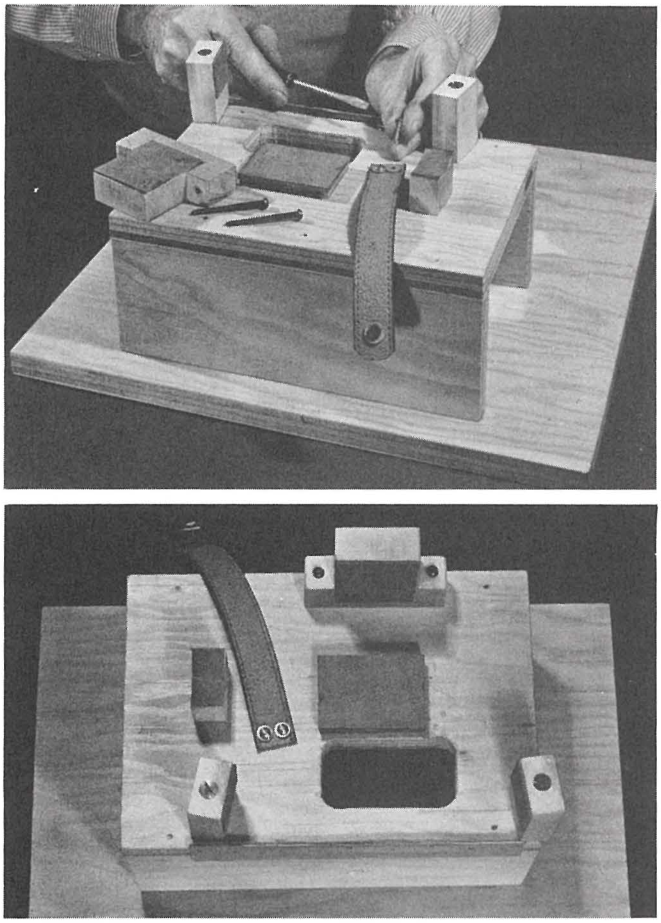
It is important that air circulate freely through the sander motor to prevent overheating. To



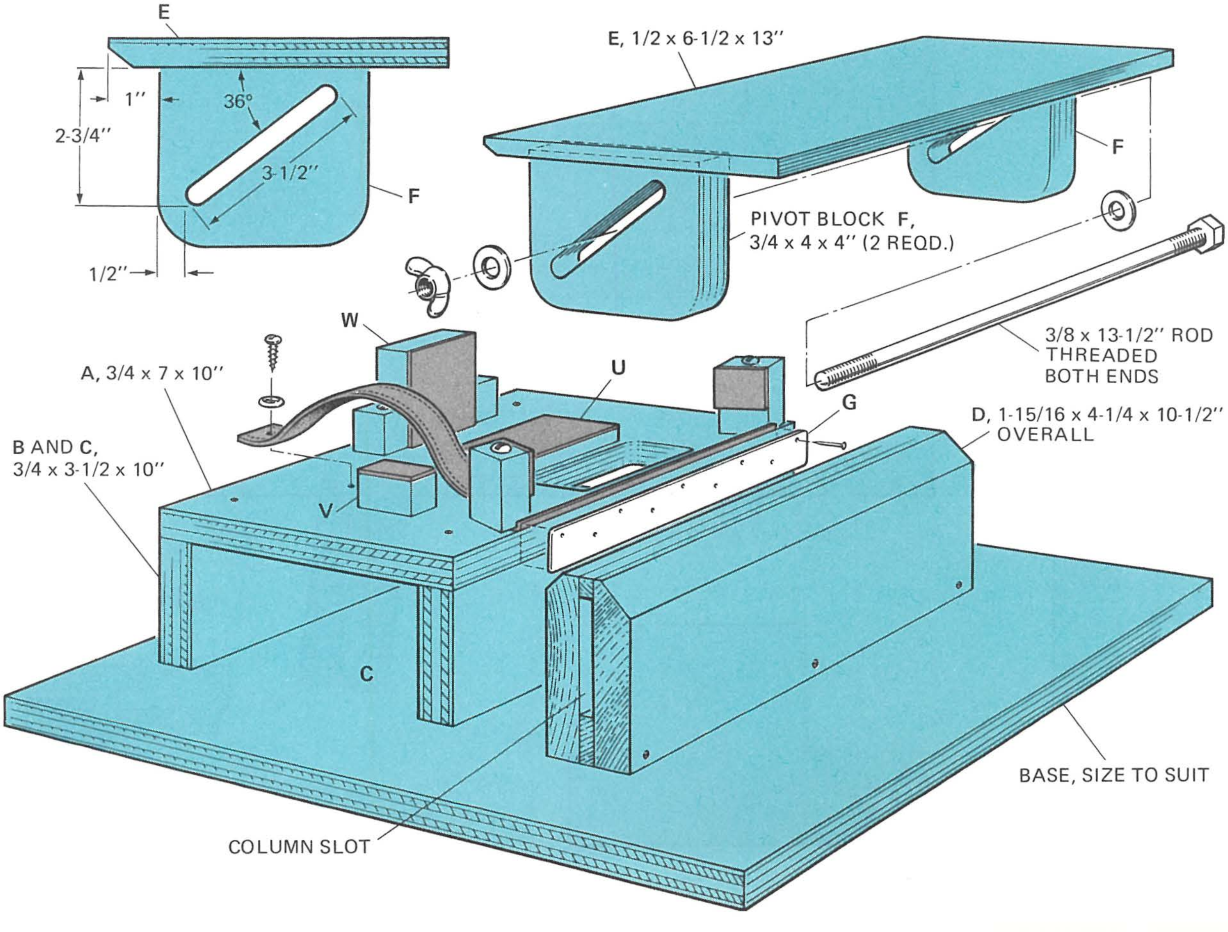
avoid any interference with air discharge from the vent openings nearer the platform when the sander is resting on its side, an opening was cut in the platform opposite these vents.

Three devices hold the sander firmly in position on its platform:

- A 1¼ x 8-in. strip of aluminum-siding sheet that projects ¼ in. above the platform surface, along the edge next to the work-supporting table. A leather strip, ¹⁄₁₆-in. thick, was glued to the side of this strip toward the platform. This acts as a cushion to prevent marring the sander housing. This padded strip projects into the space between the sander-housing edge and the sander pad, and prevents the sander from moving toward the work table.
- Leather-faced wooden blocks installed to hold the sander against the leather-padded aluminum strip. Two of these blocks flank the housing near the sanding pad, the third presses against the outer tip of the motor portion. Two more blocks are under the sander. One supports the motor housing, the other supports the handle.
- A leather strap, attached to the platform with



HOLD-DOWNS go on sander platform (top). At the right, the platform's blocks and strap are in place. Note the opening for air flow from the motor.



wood screws, and encircling the handle near the motor. Its purpose is to hold the sander in close contact with the two leather-faced blocks underneath. This strap should not be drawn too tight—just enough to keep the sander from moving upward. (For some sanders, it might be preferable to install the strap around the motor portion.) One end of the strap is anchored with two wood screws and washers, the other end by a single No. 8 wood screw installed after the sander is in position.

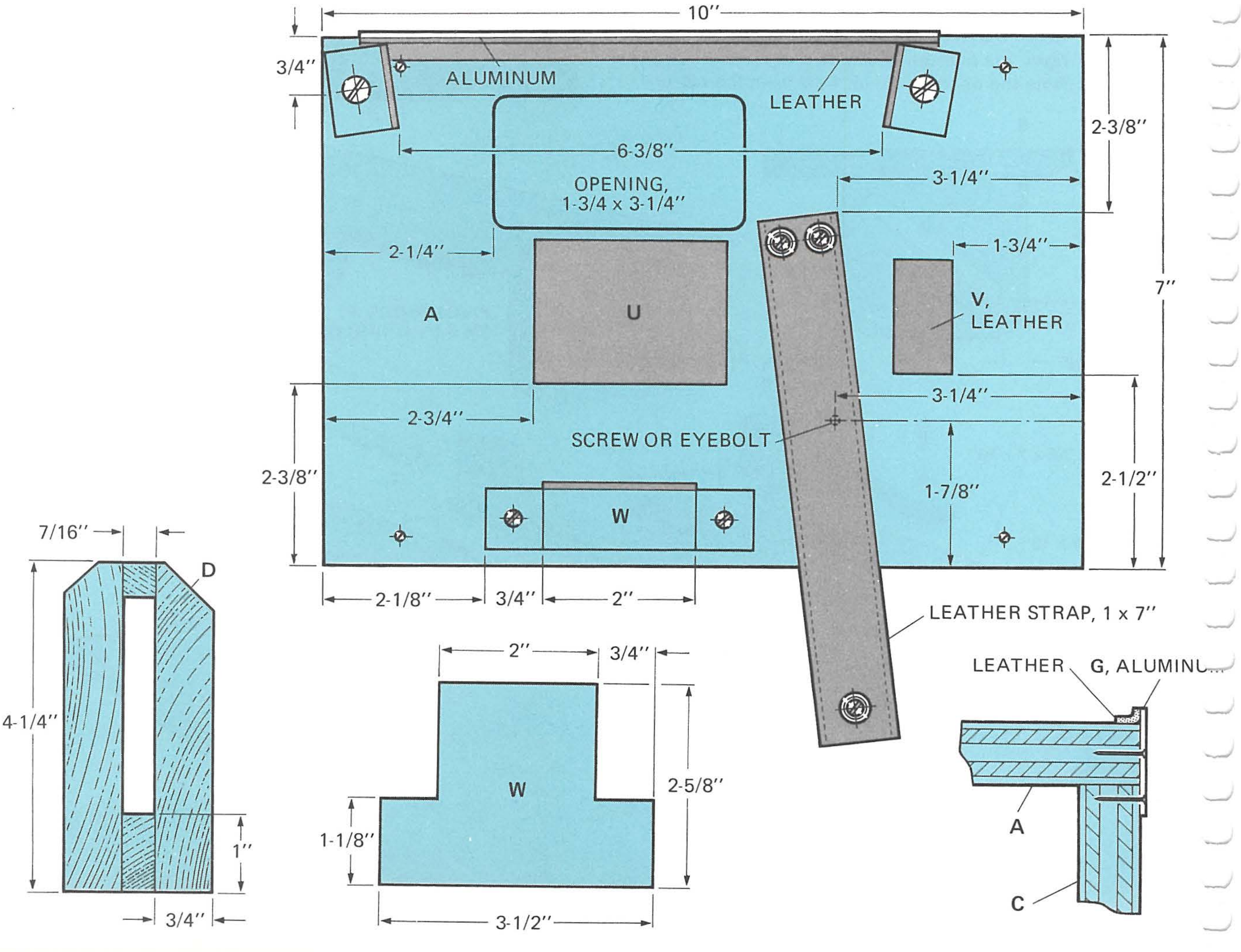
When a sander has to be removed and replaced frequently, a bolt-and-nut arrangement might be preferable.

The two blocks flanking the housing near the sander pad are secured with single, No. 12 flathead screws 3 in. long, permitting the blocks to adjust to the angle of the housing surface. The block supporting the motor housing was nailed to the platform before leather was applied, and the handle block was similarly fastened with a flathead wood screw. Two No. 8 screws hold the third block.

When the sander is running, there is some vibration transmitted to the platform. No tests were made to determine the long-range durability of the anchoring system, but no tendencies for the blocks to loosen, or other restraints to lessen, were noted.

The workpiece is normally rested on an adjustable table made from ½-in. plywood. Projecting downward from the table are two "pivot blocks," each having a diagonal slot. These blocks straddle the ends of a table column in which there is a vertical slot that measures about $\frac{7}{16}$ in. wide and 2¾ in. high. This slot was created by assembling the column from two ¾-in. pieces separated by a $\frac{7}{16}$-in.-sq. and a $\frac{7}{16}$ x 1-in. spacing strip. The column was mounted with the vertical centerline of its slot about 1¾ in. from the abrasive surface.

Length of the table-supporting column is ½ in. greater than the length of the sander platform. This provides clearance for the slotted pivot blocks to overlap the platform when the table is adjusted to a steep angle. Pivot blocks are positioned on the table so the distance between them matches the column length.

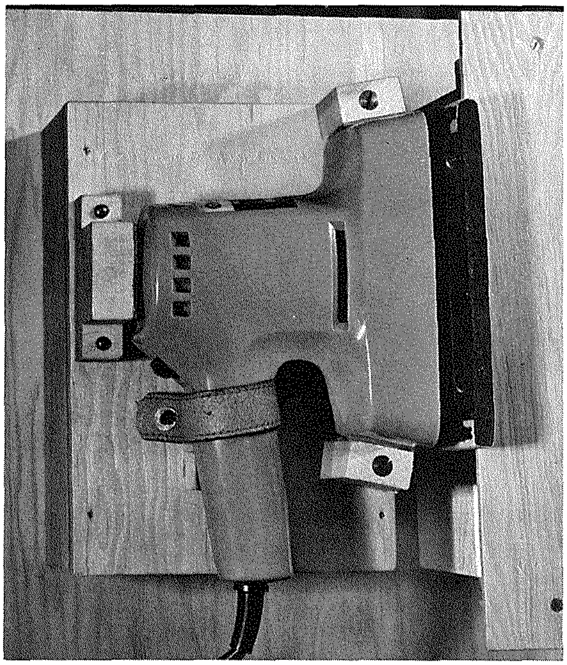


The combination of diagonal slots in the pivot blocks and vertical slot in the column provides for an infinite number of settings for the table with respect to angle and vertical adjustment, and total vertical movement is nearly 2 in.

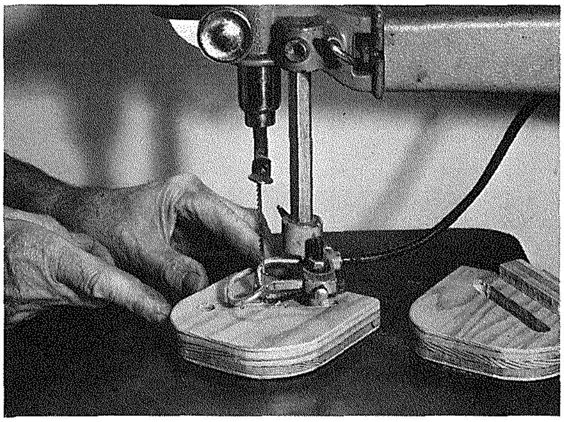
A ⅜-in. rod, 13½ in. long, threaded at both ends, runs through pivot-block and column slots. It has a wingnut on one end and an ordinary nut on the other plus two washers. Tightening the wingnut compresses the pivot blocks against the column ends, securely anchoring the table.

You may have to trim the column top by trial and error so the table can be tilted up to 45° without moving the table edge too far from the abrasive edge.

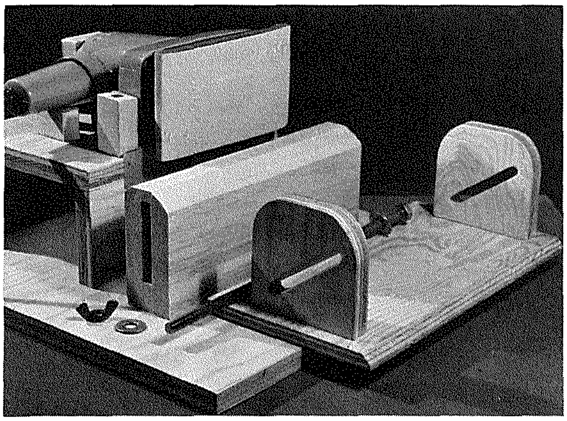
Although the sanding stand could be used without anchoring it to the bench, it does have some tendency to "walk." Use either a ¾-in. sponge rubber pad between base and bench or C-clamps to eliminate "walking."



PROTOTYPE stand was tailored to Rockwell's Model 65 sander. Alter dimensions as needed for others.

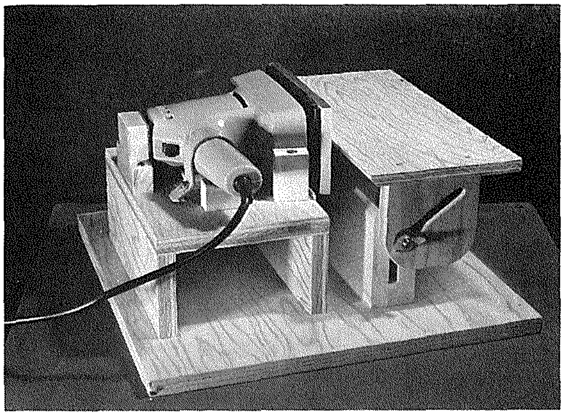


CUT PIVOT block slot by drilling holes at the ends, connecting them with jig or coping saw.

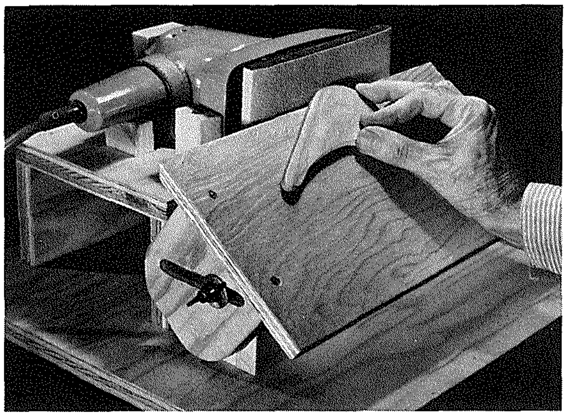


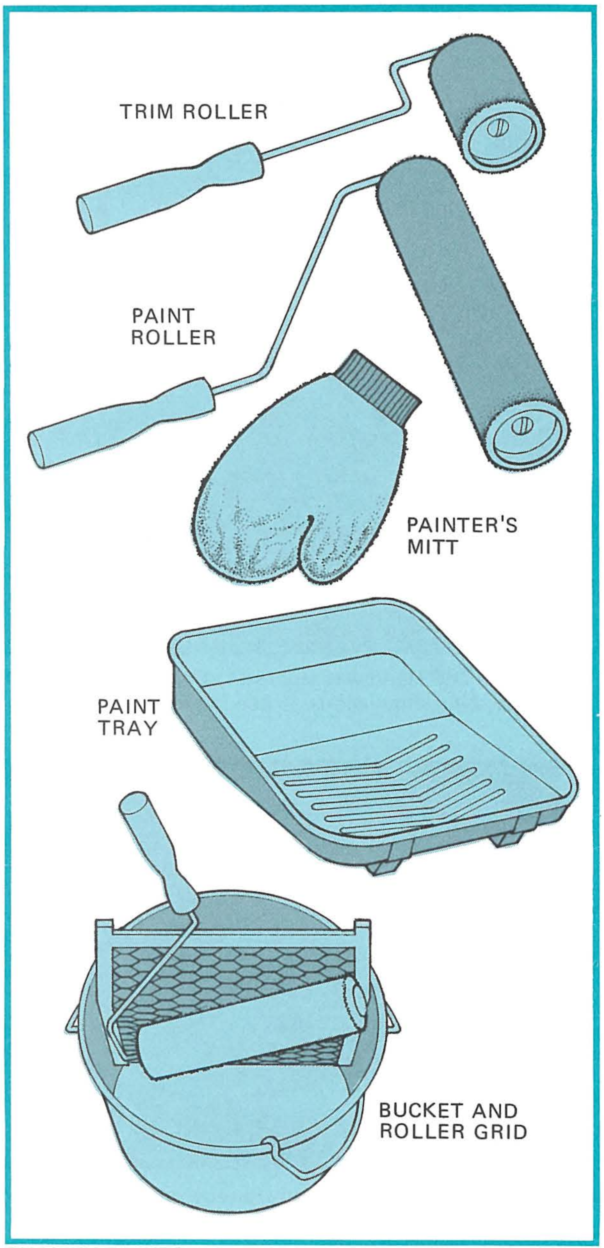
SUPPORT COLUMN is ready to receive pivot blocks for the work-support table at the right.

READY TO GO, the sanding assembly has its table in the upper position for usual right-angle sanding.

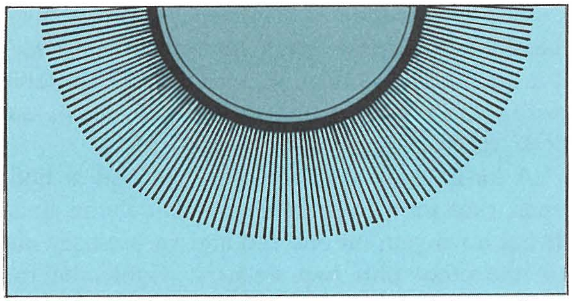


PIVOT-BLOCK and support-column slots combine to let the work table take virtually any angle.

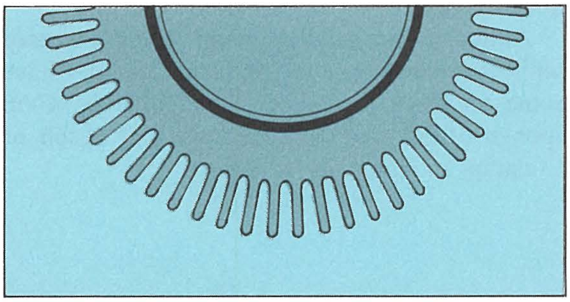




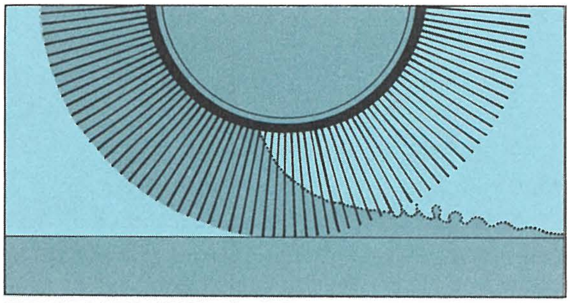
QUALITY PAINTS deserve quality rollers. The typical paint applicators shown above make painting today easier than ever. Care should be taken to select roller covers that best suit the type of paint to be used. Basically, covers to be used for latex paints should not be made of rayon or lamb's wool (water causes softening and matting of the fibers). Oil and alkyd paints (thinned with mineral spirits or turpentine) will not affect most rollers. You can use the chart on the opposite page to help you choose the correct roller cover for most home paint jobs. Just locate the paint and surface for your job.



THE NUMBER OF FIBERS per square inch in a roller cover is a critical factor. If they are too dense, they will cut down the paint-holding capacity of the roller. They will also interfere with the roller's ability to meter out paint evenly on the surface.

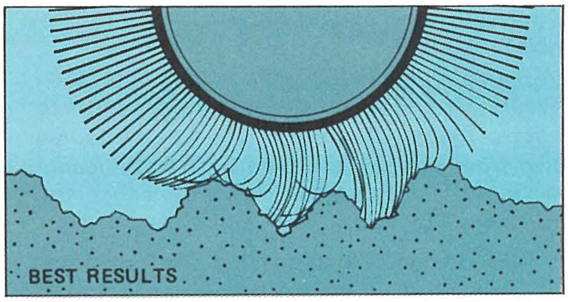


WHEN TOO FEW FIBERS are distributed over a roller surface the result is just as bad as if the roller had too many fibers. Having an insufficient number of fibers, a roller lacks the capacity fo flow paint on the surface evenly. The result: a spotty paint job.

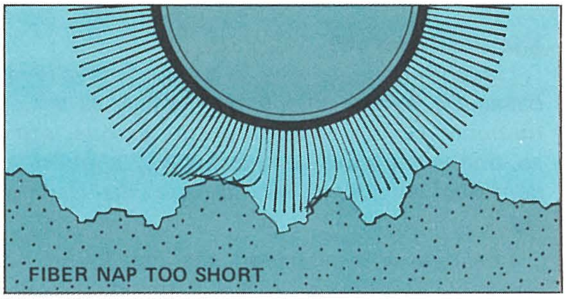


THE PROPER NUMBER of fibers on a roller will distribute a uniform coat of paint that is relatively smooth as it goes on. Such a roller also carries a good paint load and cuts down on the number of passes between the surface and the paint tray.

How to pick the right paint roller



THE ROUGHER THE SURFACE, the longer the nap length of the roller cover should be. When the fiber length is correctly matched to the surface, a smooth, uniform coat without "show-through" is possible. This is the secret of a professional-looking job.



IF THE FIBER length is too short for the surface texture, the roller cover will fail to reach the bottoms of the valleys in a rough surface like stucco. The result: a paint job with show-throughs, commonly called "holidays." The right roller avoids this situation.

SEE ALSO

Paintbrushes . . . Painting, exterior . . . Painting, interior . . . Painting, spray-can . . . Spray guns

GUIDE TO PAINT-ROLLER SELECTION

CODE FOR CHART BELOW

SIZE (Number)	CORE (1st letter)	FABRIC (2nd letter)		NAP LENGTH (3rd letter)	
9—9"	J—Jumbo	A—Lamb's wool		S—¼"	E—1"
12—12"	F—Fiber Phenolic	C—Carpet	M—Mohair	I—½"	X—1¼"
18—18"		K—Texfab	P—Pronel	L—¾"	U—1½"

PAINT OR COATING MATERIAL	SMOOTH SURFACE[1]	SEMIROUGH[2]	ROUGH[3]	EXTRA ROUGH[4]
Primers, Metal				
Chlorinated rubber	9FP, 9JP	9FPI, 9JPI		
Epoxy	9FAS	9FA, 9JA		
Oleo-resinous	9FAS	9FA, 9JA		
Red lead or tinner's red	9FP, 9JP, 9FA, 9JA	9FPI, 9JPI, 9FA, 9JA		
Vinyl	9FAS	9FA, 9JA		
Wash coat	9FP, 9JJP	9FPI, 9JPI		
Wetting oil	9FAS	9FA, 9JA		
Zinc chromate	9FP, 9JP, 9FA, 9JA	9FPI, 9JPI, 9FA, 9JA		
Primers, Wood				
Oil and alkyd	9FP, 9FPS	9FPI, 9JPI, 9FA, 9JA		
Enamel undercoat	9FM, 9FPS, 9JM	9FPI, 9JPI		
Primers, Masonry				
Block fillers, oil or latex				9FPX, 9JPX
Silicone water repellent		9FA, 9JA	9FAL, 9JAL	9FAX, 9JAX
Sealer, clear		9FA, 9JA	9FAL, 9JAL	9FAE, 9JAE
Oleo-resinous		9FPI, 9JPI	9FPL, 9JPL	9FPE, 9JPE
Primers, Wallboard				
Emulsion or latex	9FP, 9JP	9FPI, 9JPI		
Oil and alkyd	9FP, 9JP, 9FA, 9JA	9FPI, 9JPI, 9FA, 9JA		
Exterior Wood Finishes				
Oil and alkyd paints	9FPS	9FPI, 9JPI, 9FA, 9JA	9FPL, 9JPL, 9FAL, 9JAL	
Latex house paints	9FPS	9FPI, 9JPI	9FPL, 9JPL	
Oil stains	9FA, 9JA	9FAL, 9JAL	9FAE, 9JAE	9FAX, 9JAX
Wood preservatives	9FA, 9JA	9FAL, 9JAL	9FAE, 9JAE	9FAX, 9JAX
Floor Coatings				
Alkyd	9FM, 9JM, 12JM, 18JM	9FP, 9LP, 12JP, 18JP		
Chlorinated rubber	9FM, 9JM, 12JM, 18JM	9FP, 9LP, 12JP, 18JP		
Epoxy	9FM, 9JM, 12JM, 18JM	9FA, 9JA, 12JA, 18JA		
Latex	9FM, 9JM, 12JM, 18JM	9FP, 9JP, 12JP, 18JP		
Sodium silicate (water glass)	9FM, 9JM, 12JM, 18JM	9FP, 9JP, 12JP, 18JP		
Urethane	9FPS, 9FM, 9JM, 12JM, 18JM	9FA, 9JA, 12JA, 18JA		
Seamless flooring system	9FPL for base, chip coats 9FPS for glaze coats			
Interior Flat Finishes				
Oil and alkyd flat	9FP, 9JP, 9FA, 9JA	9FPI, 9JPI, 9FA, 9JA	9FPL, 9JPL, 9FAL, 9JAL	9FPE, 9JPE, 9FAE, 9JAE
Latex	9FP, 9JP	9FPI, 9JPI	9FPL, 9JPL	9FPE, 9JPE
Masonry Paints				
Alkyd	9FP, 9JP, 9FA, 9JA	9FPI, 9JPI, 9FA, 9JA	9FPL, 9JPL, 9FAL, 9JAL	9FPE, 9JPE, 9FAE, 9JAE
Latex	9FP, 9JP	9FPI, 9JPI	9FPL, 9JPL	9FPE, 9JPE
Styrene-butadiene	9FP, 9JP	9FPI, 9JPI	9FPL, 9JPL	9FPX, 9JPX
Stipple Paint	9FC	9FC		
Texture Paint	9FK	9FK		
Varnishes				
Alkyd	9FPS, 9FM			
Phenolic	9FPS, 9FM			
Urethane	9FPS, 9FM			
Wire-Fence Paints		9FAL, 9JAL	9FAE, 9JAE	9JAU

Footnotes: 1—smooth wallboard, putty coat plaster, sanded wood, smooth metal; 2—sand-finished plaster or drywall, metal, poured concrete; 3—textured plaster, light stucco, wood shakes, filled block; 4—raw block, brick, heavy stucco.

Mix wood and oil?

I recently installed a wood-burning stove in my basement venting into the same flue as my oil burner. I'm told such venting is dangerous. Is this so, and will a stove vented this way affect draft control of my oil burner?—Joseph Filtz, Bangor, Me.

I hesitate to recommend this installation, because of potential hazard and reduced efficiency of both units. There is the perhaps remote possibility of inducing "blow-back" in the oil furnace owing to draft interference, and reduced efficiency of either unit or both will cost you fuel money. I think you would be wise to plan a means of venting the stove with its own flue.

A separate prefabricated chimney might serve the purpose.

Warping mantel

The mantel over my fireplace is an unfinished walnut plank, 3 in. x 7 in. x 10 ft., and it tends to warp, the center rising about ½ in. If we turn it over it levels temporarily, but warps again in time. What can correct this? Will finishing prevent warping? What finish?—Kenneth Hafner, Fowler, Mich.

You don't say how long the mantel has been installed, but insufficient air drying is a likely cause. Planks of this size usually stabilize when thoroughly dried to a low moisture content. Before taking any corrective action, such as planing the surface, I suggest you give the plank a little more time, as it might level of its own accord. Then it might be smoothed and given a clear finish such as used on bar tops.

'Mold' on plaster

What will remove what looks like mold from plastered walls? What paint should I use to refinish the walls?—Robert Woolsey, Salem, Ore.

I assume that the "mold" you refer to is mildew. Most any household cleanser in a strong solution will remove it. My preference is for trisodium phosphate, applied with a scrubbing brush. Be sure to wear rubber gloves and protect your eyes from spatters. But removal is only temporary unless you correct the conditions that produce the mildew. Usually it results from a lack of ventilation and excess moisture in room air. A ventilating fan installed in the kitchen or bath, or one in each, operated after meal preparation or bathing will help prevent new mildew. The wall can then be repainted with any interior wall coating, such as water-based paint.

Brick breakup

My brick-faced, two-flue chimney is only about 12 years old. The cap of cast concrete appears to be free of cracks. The bricks in the seventh course down from the cap are crumbling and "losing their faces," so to speak. What's the cause and remedy?—C.S., Kans.

I'll venture to say that the most probable cause is what is known as efflorescence—a breakdown of the masonry due to certain activated salts in the mortar, the bricks, or both. Such activation usually is due to the presence of moisture or of a continuing condition of dampness. There are other less likely causes, of course. Although the defect may show in only one course of brick, it's likely that courses immediately above and below also are affected. The only cure is to replace the defective bricks with new ones.

Usually, this is a job for a professional mason experienced in this type of repair. However, if you want to attempt this chore yourself, you'll need a ready-mixed mortar, such as Sakrete, a pointing trowel, hammer, chisel, a safe ladder and several sturdy supports. You'll also have to cut some props to wedge between the courses of bricks when you remove those which are found to be defective. Cut these from 1x1-in. strips so that they're a tight fit between courses.

As you remove each defective brick tap a prop into place. Be sure to chisel out *all* of the old bricks and old mortar. Then lay new mortar, "butter" the ends of each new brick and force mortar into the joint above each one, making sure the mortar is "packed" so that there are no voids to admit water. Strike the new mortar joints to match the old.

Usually it is best to dampen the old bricks that adjoin the work before inserting the new ones in place.

Chipped iron bathtub

Is there some way of repairing permanently chipped enamel on an iron bathtub?—P. Holmetoft, New Orleans

There are several commercial products made for this purpose, some of the consistency of a heavy enamel, others of a somewhat pastier material that can be putty-knifed into the recess formed by the break. Ask for porcelain enamel at your paint store. Before any of these products is used, the break must be thoroughly cleaned with a solvent such as is sold for cleaning typewriters, and it must be dry. Although these air-drying finishes are reasonably effective, none should be expected to equal the durability of the tub's original fired-on finish.

by W. Clyde Lammey

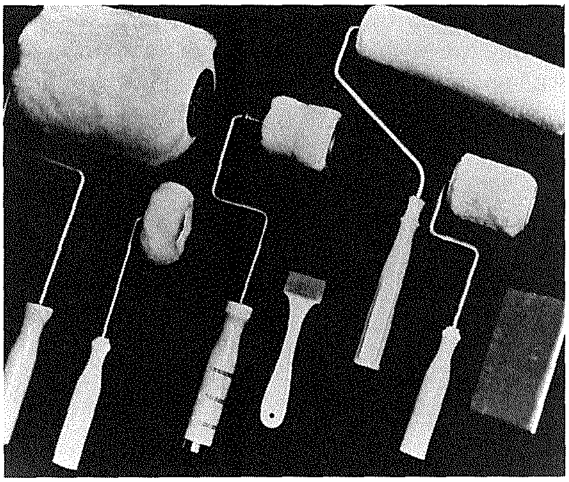
Paint your house with a roller

Outdoor painting is much faster and easier if you use a roller instead of a brush. Preparation methods are about the same, but the job goes more smoothly if you are equipped with the right selection of rollers.

▨ MANY PEOPLE seem to prefer indoor painting to outdoor. One reason is the fact that you don't have to fight the elements when working indoors. But the main reason is that painting always seems to go faster indoors because a roller is easier to use than a brush.

However, with a good water-base paint and a few special purpose rollers, there's no reason why you can't tackle the job of painting your house with the same confidence you have when painting a bedroom. The only real difference is in the size of the job.

Preparation is the same as for painting your house with a brush, which in turn is basically the same as preparing to paint with a roller indoors. Surfaces should be reasonably clean—wash any particularly dirty spots—and free of loose paint. Check for areas which may have to be scraped,



ROLLERS AND PAINTING PADS are special-purpose tools. For best results, don't skimp on your equipment.

SEE ALSO

Ladders . . . Painting, exterior . . . Painting, interior . . . Scaffolding

PLANTINGS should be tied back, if necessary, and covered with a dropcloth or plastic sheet.

USE SASH FLATS for window mullions and trim. Other special-purpose pads and daubers will speed the job.

house painting with a roller, continued

and do this a couple of days before you plan to paint.

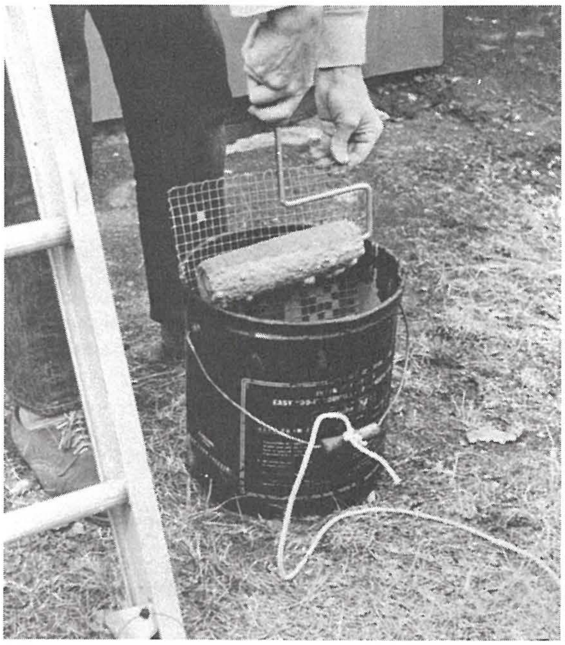
Putty nail holes and cracks. Reset any nails that have worked out. Renail clapboards or shingles that have pulled away from the surface, using extra nails if necessary.

The day before you paint, stake back foundation plantings. Just drive a couple of stakes in the outer edge of the bed for each bush and tie one end of a line to one stake, then pass the line around the bush so you can pull it away from the wall and tie it to the other stake. When painting, cover the bushes with a dropcloth or old newspapers for additional protection.

Buying the paint should present no special problems. Since you'll be using a roller, you'll have to stick with some brand of water-base paint, and here, as with many other home-improvement materials, it generally boils down to a matter of getting what you pay for. Special sales may offer a chance to save a little on the total cost, but real bargains in paint are rare.

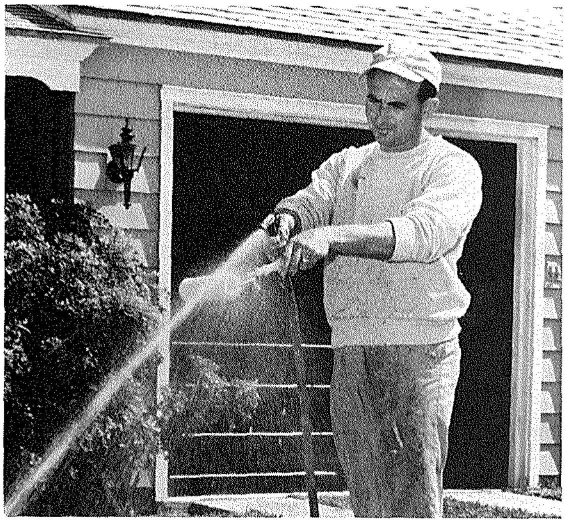
Before you head for the paint store, take a few measurements to get a rough idea of the area to be covered so you'll know how much paint to buy. Make a mental note of the different surfaces

A NONSKID GRID helps you to load rollers. Hardware cloth is shown, but you can buy a commercial unit.



MATCH THE ROLLER to the area to be covered. A small one coats a railing much faster than the standard size.

A SEGMENTED ROLLER on a flexible core wraps around down-spouts so you can paint them in one easy pass.



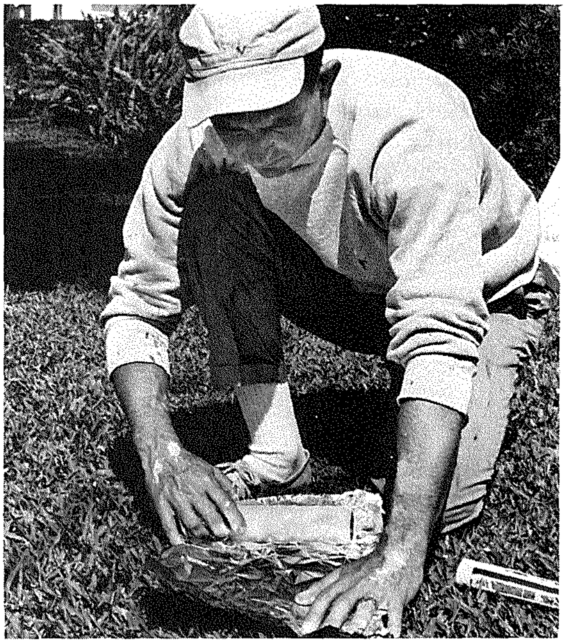
TO CLEAN A ROLLER, hold it by the handle and spin it in a strong blast of water from a garden hose.

you'll be working on; this will determine the kinds of rollers you'll need and how many.

Nap length is one important consideration when selecting rollers. It may vary from ¼ in. (most common, and still best for most work) up to 1¼ in. (special-purpose length for extra-rough masonry, chain-link fences and other unusual jobs).

A short-nap roller will lay on the smoothest coat and is best for smooth surfaces. A long-nap roller is better for rough surfaces, because it can reach the bottoms of minor irregularities. For the best compromise between smoothness and coverage capability, always pick the shortest nap that will handle the job efficiently.

TO STORE A ROLLER overnight, just wrap it in foil or a polyethylene bag and put it in the refrigerator.



The type of fiber is also important. *Always* choose a synthetic. Natural fibers such as lamb's wool and mohair will soften and lose body in water-base paint. Stick with Dynel, Dacron, Pronel, Bak-O-Nel or one of the other man-made fibers. These not only stand up to water, but are tailored to suit the job (for instance, fibers for use in long-nap rollers are given more body than those commonly used in short-nap rollers).

Quality of construction is relatively easy to judge. The roller core should be plastic, or at least plastic-impregnated, in order to stand up under heavy use. The ends should be beveled slightly so they won't spread beyond the edge of the core and become overloaded with paint.

Be sure to get a roller frame with a threaded handle, so you can use it with extension poles. Sectionalized poles are best since they can easily be tailored to the desired "reach."

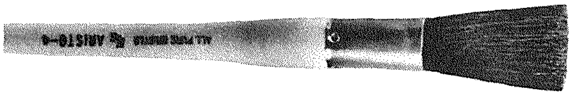
Start painting in the morning, as soon as the dew has evaporated. Begin on the north or west side and work around to the south or east side. Always start at the top and paint down, so you can cover drips and spatters.

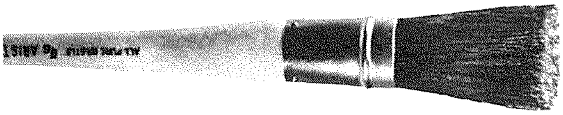
When you take a break, saturate the roller with paint to offset drying until you return to the job. Also, watch for paint setting up in the roller while you're using it. This sometimes happens in hot dry weather, and many painters alternate two rollers to avoid it. The one not in use is dunked in a pail of water.

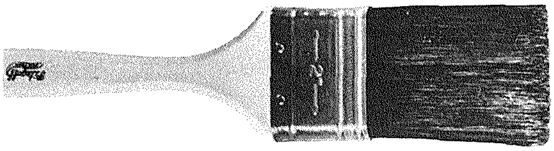
For overnight storage, just wrap the rollers in foil and put them in the refrigerator. At the end of the job, though, give them a thorough cleaning. A good roller is no throwaway tool.

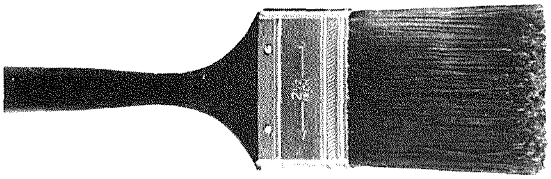
All about paintbrushes

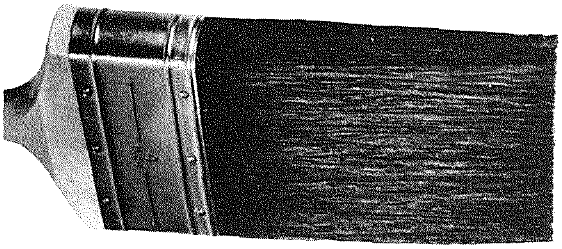
By STEVEN J. HOWARD


No. 4 oval sash-and trim

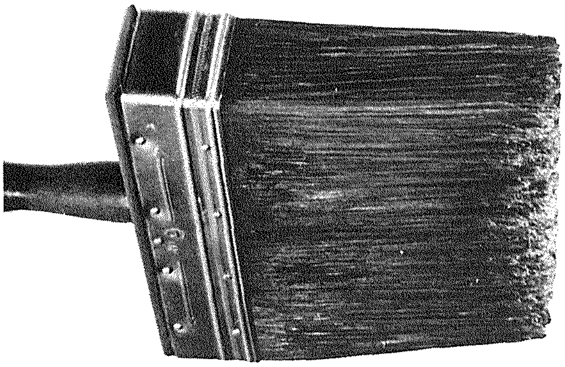

No. 8 oval sash-and-trim


Flat sash-and-trim


Varnish brush


Wall brush

Calcimine brush



Perceptive answers to some common questions on how to choose a paintbrush. The brush you choose will depend on the paint and the kind of surface you are covering

THE ONLY WAY to get a topnotch paint job is to use a good quality paint—and the *best* paintbrush you can buy. If you realize that a good brush will often cost as much as a gallon of expensive paint, you have crossed the first hurdle. The rest is easy—a matter of selecting the right brush for the job. How do you go about it? That and other questions most often asked are answered here.

Must I always buy an expensive brush?
No. Some materials attack and destroy organic bristling or synthetic fibers of a brush. They include muriatic acid for cleaning masonry, epoxy resin paint and liquid compounds used with fiberglass. Once a brush is dipped in these, it's had it. For such uses, buy the cheapest one.

Why is a good brush so important?
It spreads paint evenly, leaving no glaring brush marks or loosened bristles in freshly applied paint. It's easy to handle, doesn't pull, and you can keep cleaning and reusing it for years.

SEE ALSO
**Paint rollers . . . Painting, exterior . . .
Painting, interior . . . Spray guns**

How can I tell a good quality brush?

Look for:

- Full-bodied bristles or filaments of different lengths. The brush should feel full—not skimpy. Over half the bristles or filaments should be full length. The rest should have varying lengths to allow the brush to carry a full load of paint and release it gradually, rather than in a glob. Inexpensive brushes have most elements the same length.
- Tipped or flagged bristles or filaments. Half of the bristles should be split at the tip, but this applies only to synthetic filament brushes.
- Cleanliness. Dust and dirt shouldn't fly from the brush as you strike it across your hand.
- Good handle and ferrule construction. Handles of quality brushes are made of beech, birch, hard maple or plastic, and are balanced and comfortable. A good ferrule (the metal band that holds elements) is of corrosion-resistant steel or copper.

Does it matter whether I pick a synthetic filament or organic bristle brush?

Yes. Bristle brushes (the best have hog hair) are recommended for applying paint, varnish, shellac and other oil-base materials. Synthetic filament brushes (the best are made of nylon) are recommended or water-emulsion paints, such as acrylic latex and polyvinyl acetate. While you can use a synthetic filament brush to apply an oil-base material, *never* use a bristle brush to apply water-emulsion paint. The bristling will act like a blotter to absorb water.

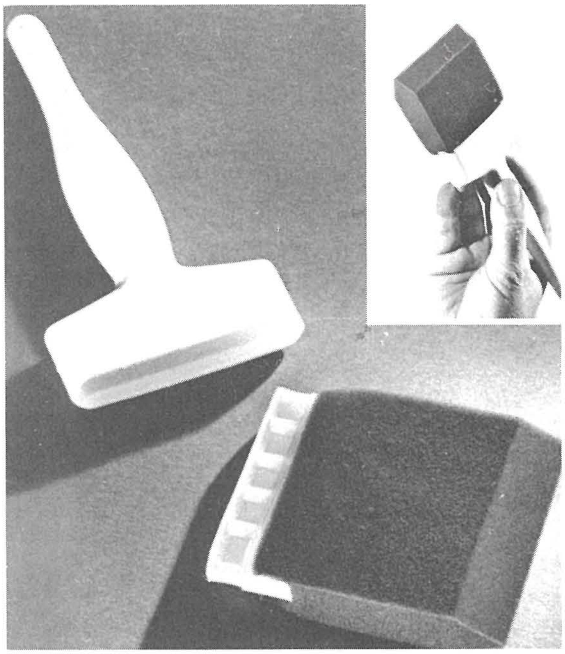
What are the common brush styles?

Wall brushes come in 3½, 4 and 5-in. sizes and are designed to hold a great deal of paint per dip. One such wall brush is the *calcimine (block)* brush that comes in 6 and 7-in. sizes. *Varnish brushes* are made in 2, 2½ and 3-in. sizes and are given a chisel trim. *Flat sash-and-trim* brushes are designed for narrow sash and for trim at window corners. They are of 1, 1½ and 2-in. sizes and also should have a chisel trim. *Oval sash-and-trim* brushes are used on irregular and curved surfaces. Their denser elements can cover ridges and rounds which would cause a flat brush to separate.

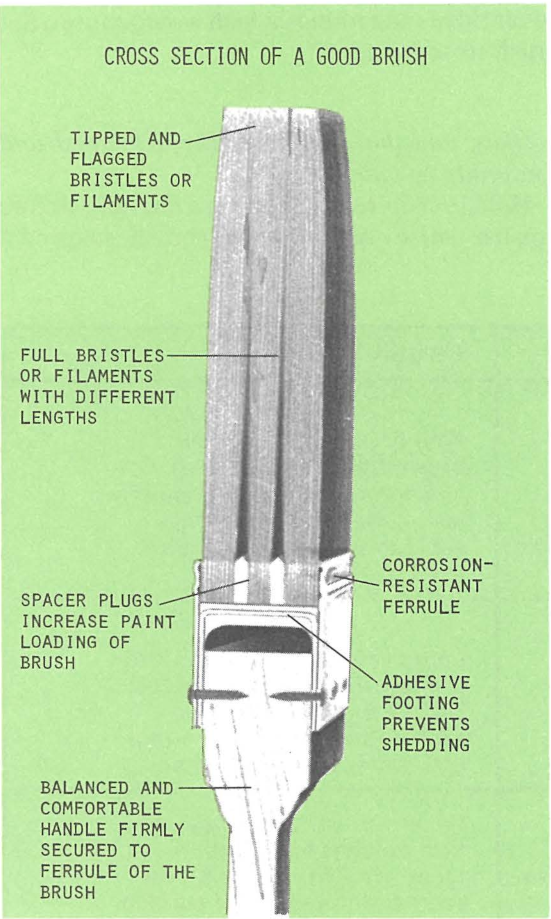
Okay, now that I've picked the right brush and I'm ready to paint, what . . .

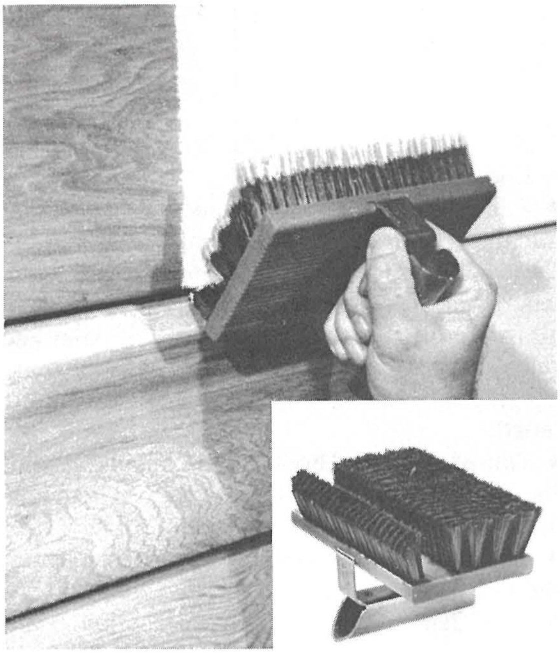
Hold it. You're overlooking a big step. Before you use a new organic bristling brush, suspend it

SURFACE OF OBJECT TO BE PAINTED			BRUSH TO USE
Large Interior and exterior surfaces—			
Asbestos walls Boats Ceilings Cinder or cement block	Clapboard Concrete walls Decks Floors Interior walls	Roofs Shingles Stone Stucco Swimming pools	Wall brush—or a calcimine brush if you can handle it. Calcimine brushes are particularly useful for exterior surfaces such as the side of a house.
Medium size areas—			
Baseboards Cabinets Cupboards Doors Eaves	Gutters Large pipes Large windows Moldings Picket fences	Rainspouts Shutters Small boats Steps Tabletops	Large varnish or flat sash-and-trim brushes for flat surfaces. Use a No. 8, 10 or 12 oval sash-and-trim brush for irregular surfaces to be painted.
Small, narrow or corner areas—			
Chairs Garden tools Ladders Metal furniture	Radiators Screens Scrollwork Small pipes	Trellises Window Frames	Small varnish or flat sash-and-trim brushes for flat surfaces. Use No. 2, 4 or 6 oval sash-and-trim brush if surface to be painted is irregular.



THIS SNAP-APART brush (U.S. Plywood) has a foam element.


CROSS SECTION OF A GOOD BRUSH
TIPPED AND FLAGGED BRISTLES OR FILAMENTS
FULL BRISTLES OR FILAMENTS WITH DIFFERENT LENGTHS
SPACER PLUGS INCREASE PAINT LOADING OF BRUSH
CORROSION-RESISTANT FERRULE
ADHESIVE FOOTING PREVENTS SHEDDING
BALANCED AND COMFORTABLE HANDLE FIRMLY SECURED TO FERRULE OF THE BRUSH



A SPECIAL SIDING BRUSH called Ruff-Rider gets the edges.

in linseed oil overnight, making sure the bristling doesn't touch the can. To remove excess oil after cleaning, stroke the bristling from ferrule to tip with a straight stick or metal comb. (Do *not* precondition a brush in linseed oil if it's to be used in lacquer or shellac.)

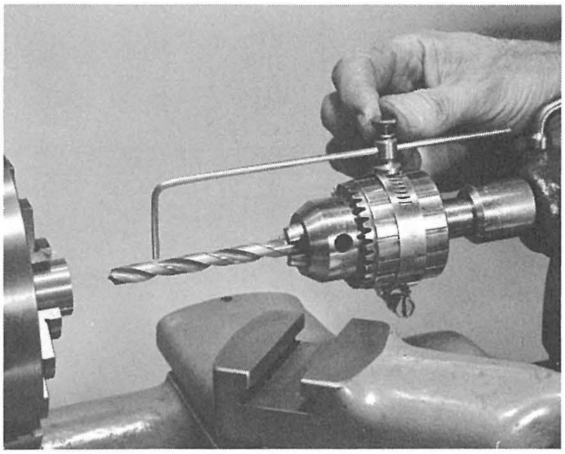
Before using a synthetic filament brush, wash it in soap and water, then comb it out. When clean, dip it into the paint halfway to the ferrule. Then tap it lightly five or six times against the top of the can. *Now* you're ready to paint.

I'm confused about how to clean a brush after use. What's the best way?

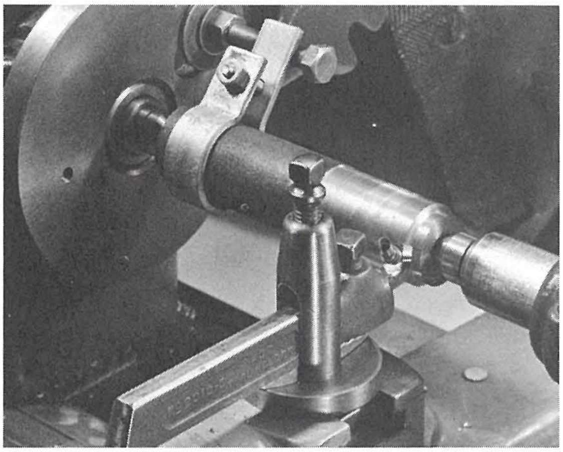
Use the right cleaner—the same solvent used to thin the paint. Use turpentine or mineral spirits for oil-base paint, enamel and varnish; soap and water for water-emulsion paints, and alcohol for shellac.

Let the brush soak for a few minutes. Then work the elements against the side of the container to loosen paint. Squeeze the elements by hand from heel to brush tip to work the paint out. If paint's caked on the outside of the brush, scrape it away with a putty knife. Repeat until the brush is clean.

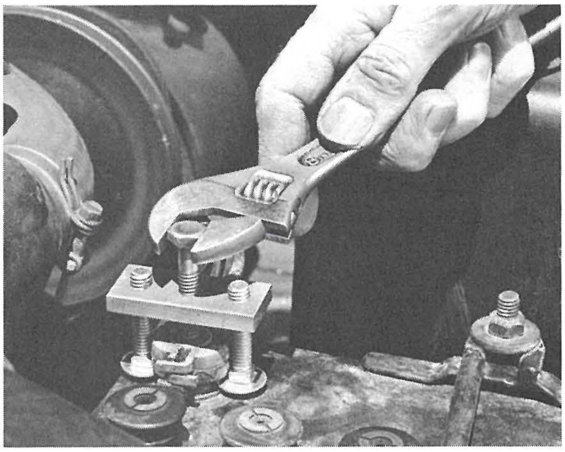
If the brush is to be stored, wash it with a mild soap and warm water after cleaning. Shake out excess water and comb the bristles straight. Wrap the brush in paper to retain its shape in drying. To dry, suspend the brush by the handle.



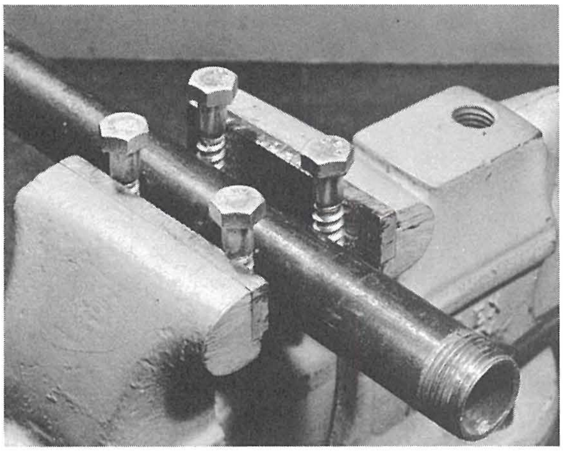
HERE'S A DEPTH GAUGE that serves as a great aid when drilling in the lathe. To make it, you need a hose clamp, binding post and a length of rod. Mount the post atop the clamp with a flathead screw and bend the rod at right angles to reach the drill's chuck jaws when in the post. With large drills, turn the rod so it rests in the drill's flute.—*Peter Legon.*



LARGE-DIAMETER WORK can be turned between centers using a homemade lathe dog. First, bend a steel bar around the work tightly, then give the ends a sharp, straight-up bend to act as a driving tail. Drill the ends for a clamp screw to hold the dog securely; fasten a bolt with two nuts through the faceplate slot for driving the dog and work.—*C.W. Woodson.*

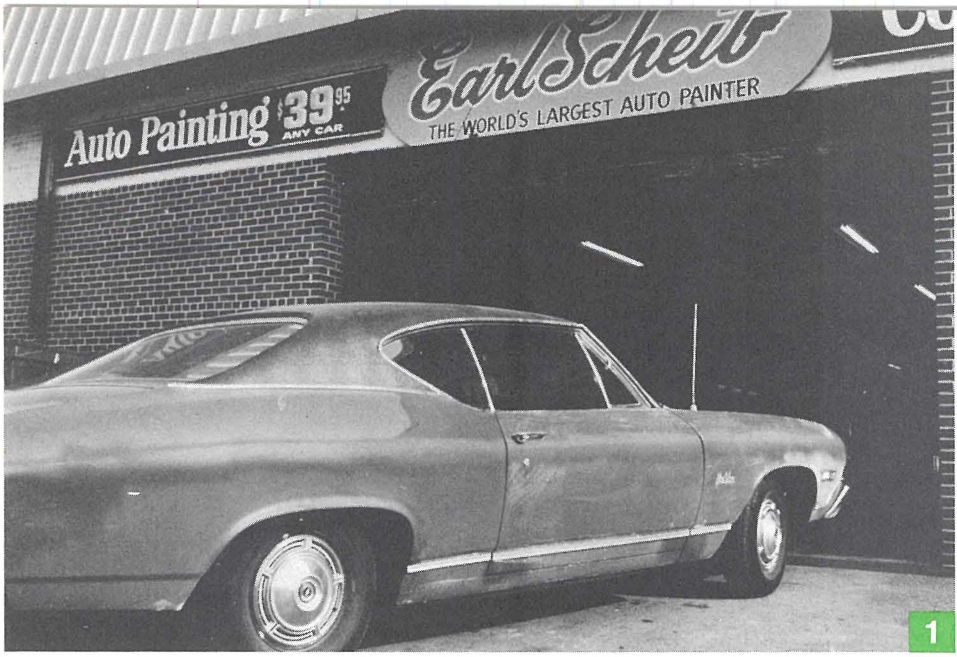


A CORRODED BATTERY cable-clamp can be easily removed from the terminal with this puller. Drill and tap a short length of ¼x1-in. flat steel to receive two carriage bolts spaced to fit the clamp, plus a centered capscrew. Allow the boltheads to grip the clamp's lower face and tighten the capscrew to lift off the clamp.—*C. W. Woodson.*



TO KEEP PIPE from turning in a smooth-jawed vise when threading or cutting, you can use four lagscrews as shown above. As you tighten the vise, the sharp screw threads bite into the pipe and hold it fast while you work on it. One word of caution though: If using a soft pipe, go easy on the muscle.—*Victor H. Lamoy.*

IF YOUR PLANTS are heavy with green tomatoes when the first frost threatens, you can still bring them to a delicious ripeness and color. To do it, simply pull the plants up by the roots and suspend them upside down from a line stretched in your basement. In a few weeks the green tomatoes will turn red and boast vine-fresh sweetness.—*G.E. Hendrickson.*


Auto Painting $39.95 ANY CAR
Earl Scheib
THE WORLD'S LARGEST AUTO PAINTER

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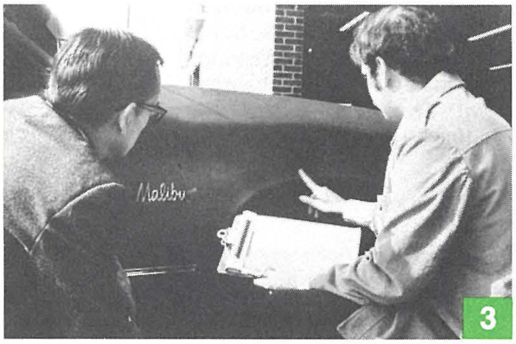

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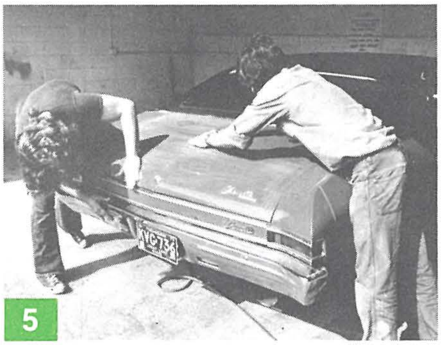

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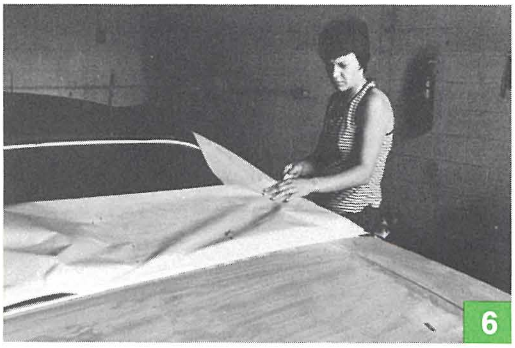

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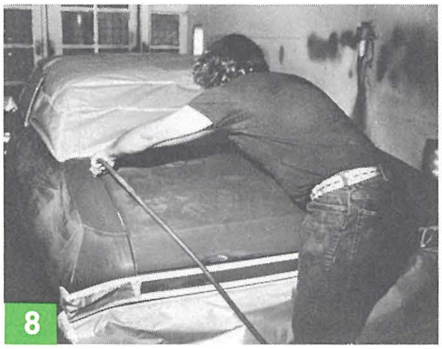

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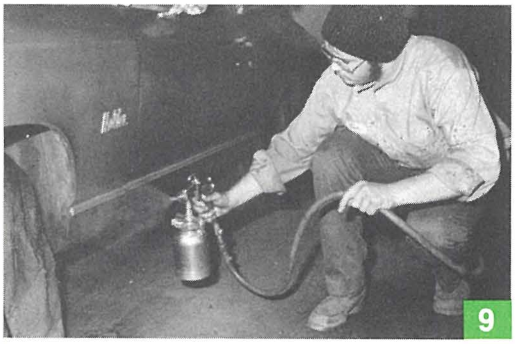

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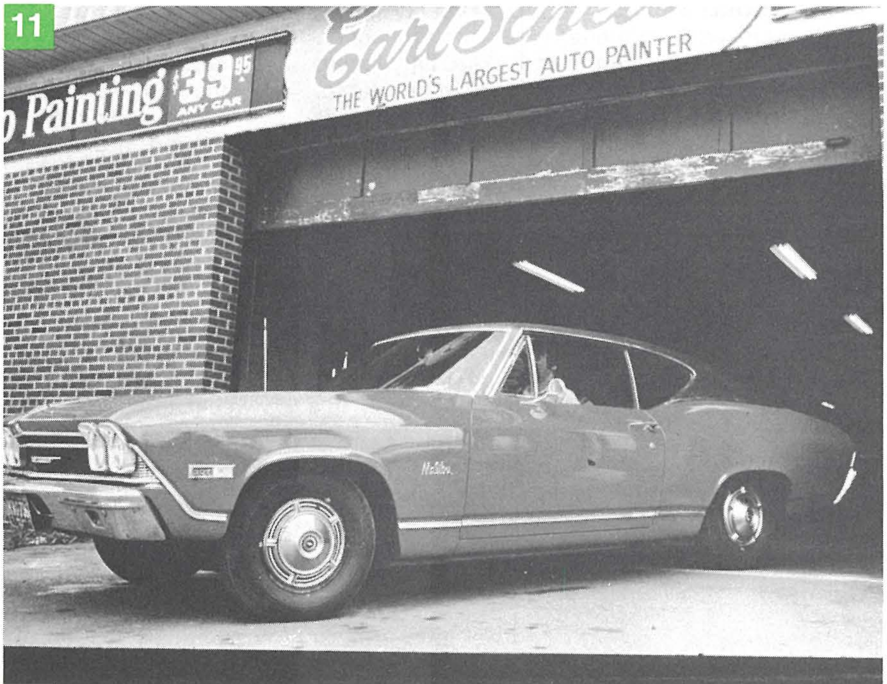


11

How to buy a paint job for your car

By ROBERT LUND

IF YOUR OLD CAR looks beat up and you've got the fever to buy a new or a late-model used-car, you can cool the fever fast by checking out prices. The more prices you check, the better the old car begins to look. But, how do you make the old heap look as good physically as it looks in your mind when you consider the bucks you would have to shell out for a newer car?

Have it painted. Of all the ways you can spend money to spruce up an old set of wheels, a new paint job will get more of your money back when you go to sell the car than anything else you can do to it or hang on it.

A professional paint job will cost you anywhere from $40 up. Mostly up. The price depends to some extent on what the car cost when it was new. Repainters don't like to admit this, but it's true.

The price is also contingent on how much preliminary work has to be done before the car can be painted. Bumping, blasting and sanding, filling in low spots in the metal, grinding, deburring, feather-edging, caulking, filing, masking—these are some of the preliminary steps that have to be done to insure a quality job.

Because of the make-ready that has to be done before the paint goes on, refinishers are reluctant to quote prices over the phone. They want to see the car.

I called 10 shops in the Detroit area in gathering the information for this story and didn't get a straight "We'll do it for X dollars" answer from any of them. One shop quoted a price plus materials and labor. That didn't tell me much—because the entire job is materials and labor. What else is there?

The reason repainters don't like to quote prices sight unseen is that the reputable shops give a guarantee. But they won't guarantee the job unless the surface has been prepared correctly to accept the paint.

If you want the car painted without preparation, there are shops happy to oblige with a once-over slap-and-dash. But don't try to get a refund or have the work done over if the paint flecks off.

There's another reason why shops want to see the car before quoting a price. All repainters are in the body business, more or less. They make money removing the lumps and the bumps.

Most refinishers remove small imperfections in the metal—nicks and scrapes—without charge. But everything else is extra. Any car that has been on the road a few years is likely to have

REPAINTING A CAR, this one a Chevelle, starts at 1 when you roll into the paint shop for an estimate. The gauge in 2 is an "Estometer," used to estimate body damage in a standard manner. In 3, manager Mark Buehler, at this Earl Scheib paint shop in Detroit, is shown explaining to author Robert Lund the work that has to be done before painting. For this car some body work was necessary which raised the cost of the job. Rough sanding is shown in 4, and hand sanding in 5. The car is then masked as shown in 6. A final sanding, 7, is done with a machine called a "jitterbug." The last step before painting is shown in 8: The car is cleaned of all dust and dirt with an air hose. In 9, the car is sprayed. The masking is ready to be removed soon after spraying as shown in 10. In 11, the car is wheeled out with its fresh paint. The entire operation is completed in less than a day.

SEE ALSO

Autos, body care . . . Autos, winterizing . . . Rust, auto

a rust spot or two, dents, banged-in areas or some sort of body scars. So they like to get you in to see what body work they can sell you before they quote a price.

After striking out on the phone, I took my car around to several shops. Actually, the car is in pretty good shape and doesn't look like it needs repainting. Nevertheless, I got bids ranging from about $100 to $150—despite the fact that little or no body work would be required. Then I decided to try the Earl Scheib chain.

Earl Scheib is the undisputed king of automobile repainters in the United States. The company has shops across the country and Don Scheib, a vice president of the firm and Earl's son, told me the company turns out between 600,000 and 700,000 paint jobs a year.

The Scheib name is a dirty word among other repainters. Earl undercuts everybody else on price and it bugs the heck out of the competition. But Scheib's detractors are hard-pressed to accuse him of anything very reprehensible. The worst bad-mouthing I could turn up on him is that he allegedly charges customers more for body work than non-Scheib shops.

This may be true or may be sour grapes. You can find out easily enough by taking your car to a Scheib outlet and a non-Scheib painter and asking for written estimates at both places.

Scheib's charge for a paint job is the same anywhere in the United States. The price covers washing the car, hand sanding, removing nicks and chips, priming any bare metal and repainting, including wheels and door jambs. The price does not include major body repairs. That's extra. From time to time the company offers a special deal where it throws in $10 worth of body or fender work at no charge.

The basic price is limited to 27 colors. If you want a color that isn't on the basic chart, the price is higher. For the higher price, you can have any color you want. Two-toning and trick combinations are extra.

one-day service

Scheib gives one-day service. Get the car in by 7:30 a.m. and you can drive it home by 6:00 p.m. People don't like to give up use of their cars for more than a day at a time and I was under the impression the one-day deal might be a gimmick to get the car in and then stall the customer until the shop could get around to painting it.

Charles Moninger, a division manager for Scheib, corrected me on this. Moninger works out of Detroit and directs the activities of shops in Michigan, Ohio and Kentucky. "We handle so many units a day," Moninger explained, "that we run into a parking problem if we don't keep the cars moving."

Scheib also gives a guarantee good for five years on a pro rata basis. It's the same type of guarantee you get on tires. You don't get all your money back, but you get an adjustment or a credit toward a new paint job, depending on how much time has elapsed since the car was painted.

If Scheib is the king of the repainters, MAACO is the crown prince. MAACO is a company formed in 1972 and the full name of the firm is MAACO Auto Painting and Body Works. One of the two founders of the firm is Anthony A. Martino, who put together the AAMCO Transmission chain. Martino has sold his interest in the transmission company.

MAACO has three prices. For the basic price you get two coats of paint. Scheib uses one coat. On the two higher-priced jobs you get three coats of paint. Most of the difference between the two is in the preparation of the surface. The highest-priced job includes hand and machine sanding of the finish and a special coat of primer and sealer. MAACO advertises a choice of 7000 different colors.

I asked Dan Rhode to explain how a MAACO job differs from an Earl Scheib job.

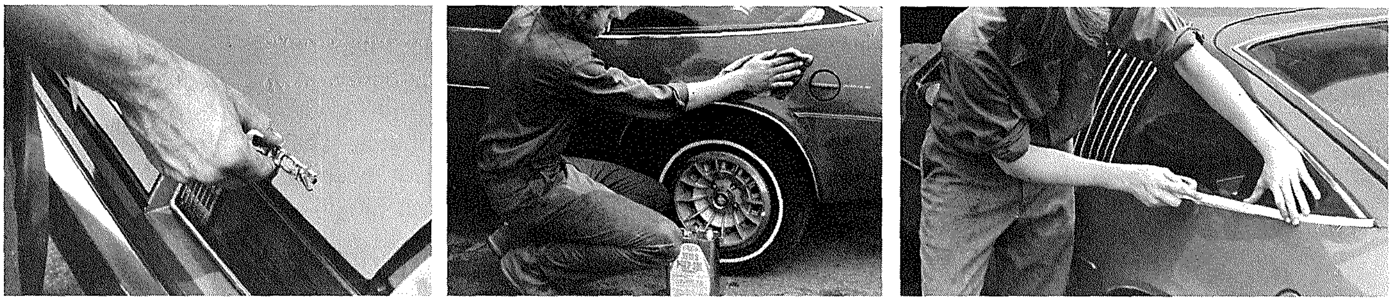
"We see a market for a quality paint job between Scheib's price and independent shops that charge more. After spraying the car, we move it directly into a gas-fired bake oven to dry for 35 minutes at a temperature of 180° to 185°. The car is never exposed to the outside air, so you get a cleaner job."

to bake or not to bake

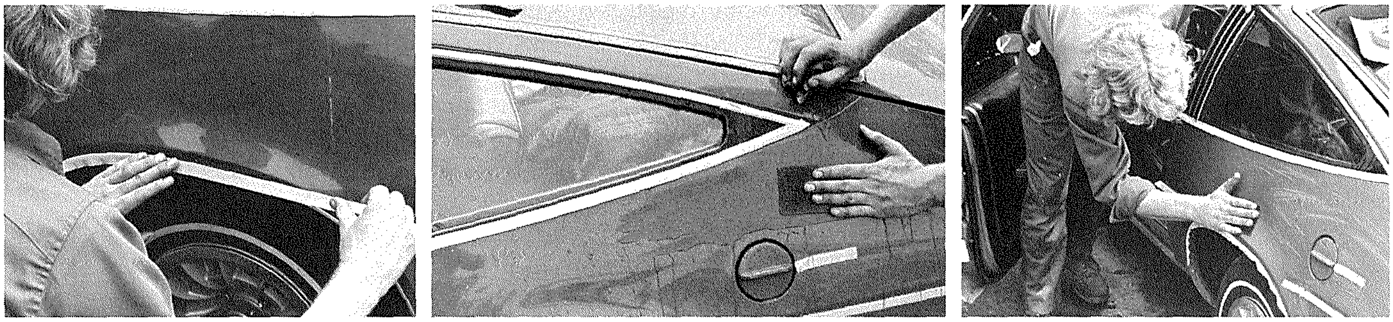
There's a small dispute among repainters over the merits of baking the paint on versus nonbaking. At one time, a bake oven was the only way to get a hard, smooth finish. Some shops will use ovens, others don't. Scheib used to use ovens, but phased them out last year.

Nonbake painters say the synthetic enamels and lacquers used today dry so fast that baking isn't necessary. Pro-oven painters agree that the new paints dry rapidly, but are quick to say you still get a superior finish by baking.

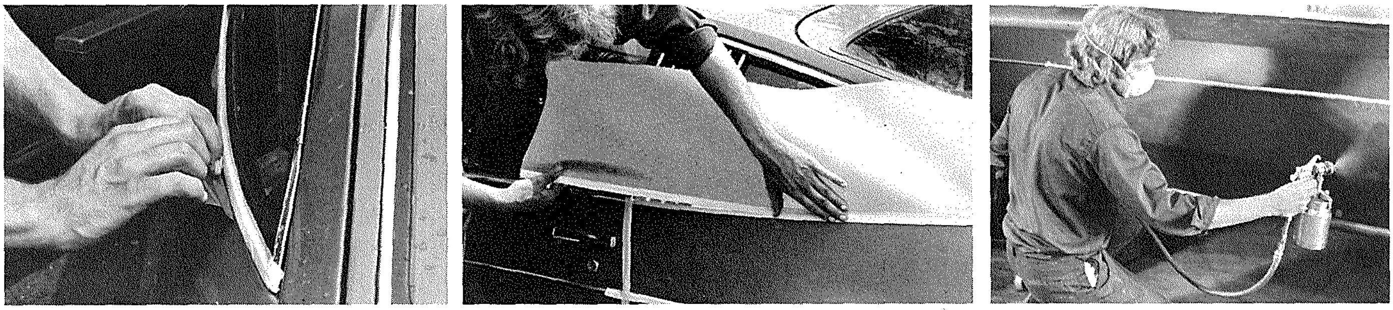
How about doing the job yourself? It isn't the easiest task, but it *can* be done (see page 2187). And if you don't want to tackle the whole job yourself, you can at least do some of the preliminary clean-up and make-ready work part of the cost.



START THE JOB by removing any of the trim that will come off easily (left). Then wash the car to remove all of the built-up dust and dirt (middle). If necessary, use a wax and grease remover. Apply tape carefully (right).



THE TAPE is easily worked around the molding contours (left). Take your time and do a thorough job, covering only those parts to be protected from the spray. Wet-sand the entire car (middle and right). Keep both car and sandpaper wet.



WHEN SANDING get into the crevices (left) where a wax build-up would repel the paint. Mask all glass with a heavy paper (middle)—paint will soak through newsprint. If working inside, wear a mask (right) and provide for good ventilation.

How to repaint your car yourself

By MORT SCHULTZ

■ YES YOU CAN paint your car yourself and come out many dollars ahead—even if you don't own a compressor and spray gun. The equipment can be rented.

I called two companies in my town that rent tools. One wanted around $18 a day for compressor and gun, and the other wanted about $15 (plus $5 if equipment was returned uncleaned).

Unless you intend doing extensive spray painting, it doesn't pay to buy equipment. I got an "on sale" price of about $200 for a unit suitable for auto painting from Sears. The regular price is about $300.

"Even if a man doesn't want to get involved with spray painting, he can still save himself much money by preparing the car and bringing it to a professional shop ready-for-painting," says

SEE ALSO

Autos, body care . . . Painting, spray-can . . . Rust, auto . . . Spray guns

Russ Wolfe, owner of Autocraft Collision Service in Union, N.J. Russ paints cars for a living and he willingly shared his knowledge with me.

For example, Russ charges about $150 to completely prepare and repaint a car the size of a Mustang. He charges only about $60 if the car is brought to him ready for painting. The charge includes the price of primer, paint, masking and repainting.

By "prepare" we're speaking about a car which doesn't need any body work. If your car has dents or rotted areas which you want to get rid of before repainting, these must be fixed first.

Whether you rent or purchase a compressor spray unit, make certain that compressor and gun are matched. The compressor should supply the amount of air the gun requires. A 1 or 1½-hp compressor which delivers 3 to 5 cu. ft. of air per minute and a gun to match are suitable.

two types of spray guns

There are two general types of spray guns: The external-mix (siphon) gun mixes paint and air outside the gun at the nozzle. An internal-mix gun mixes air and paint inside the gun.

You will probably be renting an external-mix gun. You can tell it by the air hole in the cap. This hole must be kept clear while spraying.

Other materials you will need to repaint a car (or prepare it for repainting) include sheets of 100D sandpaper and 320A or 400A wet-or-dry sandpaper; a sanding block; rolls of ¾-inch and 1½ or 2-inch-wide masking tape; tack cloth; spray mask you *must* wear when painting; and masking paper.

As for primer and paint, it's important to do business with a reputable auto paint supplier who sells a name brand. The counterman at a supply company which has a good reputation can be an invaluable source of information.

The painting supplies you will need are: a half gallon of wax and grease remover; metal conditioner; body putty; a gallon of lacquer thinner; a half gallon of primer (lacquer base), and a gallon of acrylic enamel finish paint. You can figure out exact quantities for your car with the help of your supplier—the amounts suggested here are for an average-size car in the Mustang class.

acrylic enamel is easiest

The reason acrylic enamel is recommended is that, for one thing, it's the easiest to work with. Furthermore, it can be sprayed over finishes of cars not originally painted with acrylic enamel. Conversely, you should not spray an acrylic lacquer on a car that's been painted with enamel. The new paint may crack.

When you spray on acrylic enamel, you will notice that it dries with a gloss and dust-free in about 20 minutes. There is no significant overspray problem, because the spray won't stick to any surface it hits if it travels more than about three feet.

Now, before we really get down to brass tacks and discuss exactly how to repaint a car, let's outline the conditions under which the job should be done. First of all, allow yourself at least one complete weekend—more if body work is needed.

But however long it takes you, *take your time.* There are no shortcuts. A quality repainting job requires meticulous and patient workmanship.

it's best to work indoors

Ideally, it's best to work indoors, free from dust and bugs that can stick to wet paint and ruin the finish. But few people have access to an inside area large enough to make this possible. This means you'll probably have to work outdoors. Pick a location as free as possible from flying insects and wind-blown dirt. Work in the shade, but not under trees that may drop leaves, sap, berries or bird droppings. Wait for a weather forecast of clear, warm (70° to 80°), low humidity and no wind! And don't smoke while painting or bring any flame or equipment that may spark near paint.

If you do work indoors, be sure the area is well ventilated and set up an exhaust fan to carry paint fumes away. A mask is a must indoors and is recommended even when working outdoors.

One last tip: It's not a good idea to do preparatory work on a car and then postpone painting unless you lay the car up in a garage where it won't be affected by weather. Leaving it outdoors or, worse yet, driving it, subjects sanded metal to dirt and elements that may cause rust. All the work you did in preparing the surface will be wasted.

closely follow steps

The best way to describe how to repaint a car so you get a top-quality job is to "walk" through the steps in 1-2-3 order:

1. Remove all brightwork that is removable, including windshield wipers, mirrors, nameplates and moldings. If you can remove the bumpers, it would be helpful.

If it isn't apparent how a piece of trim comes off, look or feel behind the piece for a clue. The brightwork in most cars is not difficult to get off, which is good, because rust usually starts behind these pieces.

Pieces of brightwork you can't remove will have to be masked.

2. **Wash the car thoroughly** to remove all dirt and dust. Dry it, and then wash the surface down with wax and grease remover.

Caution: The products you employ all have very clear, detailed and important instructions for use on their cans. Read and follow them!

3. **To prepare for initial sanding,** examine the areas around chrome pieces which have remained on the car. If there is rust butting them, mask the chrome with masking tape to protect it against the heavy sanding that's necessary.

Now, sand the entire car with wet-or-dry sandpaper, using water as a lubricant. Keep the surface and sandpaper wet. A good technique is to have a pail of water at your feet. Keep dipping a rag or sponge in the water and squeeze it over the surface. Dip the sandpaper into water often, too.

The purpose of sanding in places other than rusted areas is to get a surface to which paint will adhere. There is no need to get down to bare metal, but make sure you remove all oxidation and gloss.

Take pains to sand in all corners and crevices. Wax has a tendency to build up in these spots. Unless removed, it will prevent good paint adhesion.

You can use a sanding block where possible. Otherwise, hand-sand. It's not advisable to use a power sander.

remove all rust

Use 100-grit *dry* sandpaper to remove rust, or use a wire brush driven by an electric drill. Go to bare metal in rusted areas. The surface must be left absolutely bright and rust-free, or rust will form and ruin the job.

4. **Wash the car** with wax and grease remover again, and allow the surface to dry. As it's doing this, mask areas that may receive over-spray, including glasswork, headlights and taillights, grille and moldings.

5. **Treat bare metal areas** with metal conditioner, which etches the metal so that the primer will adhere.

6. **Mix primer and thinner** to the proportions spelled out on the can. Spray one coat of primer over the entire car. Then go back and give it another coat.

As you go along, you will get a "feel" for spraying and for knowing when the surface has received an ample coating—not too little or too much. If the primer coating is too light, it will look dry and gritty. If it's too wet, it will run and start splitting when it dries.

7. **Let the primer dry** for one hour. Then examine the surface for "low" spots. Treat these imperfections with body putty.

Sand the entire car once more with wet-or-dry sandpaper. Keep the sandpaper wet. See to it that all scratches and other imperfections are removed. Sand puttied areas smooth and even with the surface.

8. **Remove old masking.** By this time, it's gotten messy.

Sponge-wash the car to remove sanding residue, and give it another treatment with wax and grease remover. Blow dust out from behind molding with the air hose.

9. **Remask areas** that require masking. If you have trouble getting the masking tape to adhere to rubber seals around glass, wipe the rubber lightly with lacquer thinner.

Make sure all area that have to be masked are masked, but also be certain that a surface to be painted is not masked.

10. **See that the surface** is perfectly dry and wipe it down with a tack cloth to remove dust.

Mix paint and thinner according to the instructions on the can and paint the car.

lay on light coats

Begin by spraying on a light coat. Coverage is not important. You simply want to lay down a tack coat which will provide a base for subsequent coats.

Do not overlap paint. Don't hit a spot more than once.

By the time you've done the whole car, paint will have set up sufficiently so the surface is ready for a second coat. Make this one medium-heavy. You should barely be able to see the primer coat beneath the paint when this second coat has been applied.

The third coat should be the final coat and provide complete coverage. The finish should look smooth and glossy as this coat is applied.

As you spray, hold the gun about 6 inches from the car. Keep the gun straight and perpendicular to the surface at all times. Do not arc the gun. Sweep it across the surface smoothly.

Let the paint set up overnight. Then, very carefully, strip off all the masking, pulling the tape slowly so you don't peel the new paint. Then replace all the brightwork.

The right way to paint your house

By LEN HILTS

▨ THE PROS WILL TELL YOU, the real secret in painting a house is in the preparation. Take the time to do a good job of preparing the place and you can be assured of a fine finished product.

The first step is to wash the house. A good hosing is sufficient for big, well-exposed walls. Be sure to rinse away all the chalky residue of the present coat of paint. Look for areas with special problems, such as mildew, and give these an extra treatment. Wash them down with a solution of trisodium phosphate and water. (See the TSP package for mixing instructions.) Use the same solution on walls which haven't been exposed to the weather—such as the walls of porches, the undersides of eaves, etc. Because these haven't weathered much, they are probably covered with strange substances—pollutants—deposited by the air. Rain washes the exposed walls, but not these, and the pollutants may cause the new paint to quickly peel and flake away.

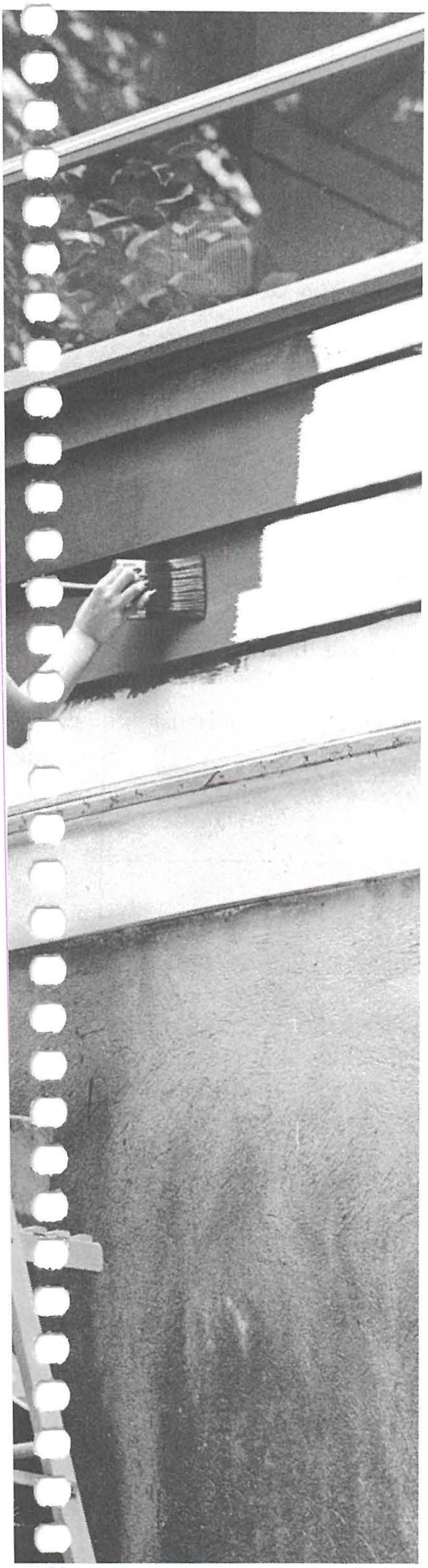
Now get out the scraping equipment and go over the entire house. Use a scraper and a wire brush and scrape all loose, flaked and broken paint. Try to work over all areas where the present paint is not well bonded to the surface. After scraping cracked paint, use the wire brush or sand paper to feather the edges of the remaining paint, so that you don't end up with unsightly ridges and marks in the new paint.

Use a good primer, most of which are fairly fast drying, to seal every place you scrape. Don't apply new final-coat paint over bare wood.

Go over all of the windows and the door frames, scraping them where necessary. Examine the caulking around their edges, and dig out any which is loose or cracked. Use a caulking gun and a good grade of caulking compound to repair these now, before you apply the final coat. Look especially at the top of window

SEE ALSO

Ladders . . . Paintbrushes . . . Painting, interior . . . Paint rollers . . . Scaffolding . . . Siding



Selecting primers and top coats

The charts below show primers and top coats appropriate for exterior surfaces. Find the primer or the choice of primers for the surface, then the top coat—or work backward from the desired top coat to find the primer and make sure that coatings are right for the surface to be painted

OUTSIDE PRIMERS	SMOOTH WOOD SIDING	ROUGH-SAWN SIDING	SHINGLES AND SHAKES	PLYWOOD	WOOD TRIM	CONCRETE, BLOCK, STUCCO	BRICK, STONE, CINDER BLOCK	IRON AND STEEL	GALVANIZED STEEL	ALUMINUM	ALUMINUM SIDING	COPPER, BRASS, BRONZE	ASPHALT ROOFING	SHINGLE AND SHAKE ROOFING	METAL ROOFING	TERNE PLATE ROOFING
OIL PRIMER (1)	●	●	●													
ALKYD PRIMER (2)					●											
LATEX PRIMER (3)	●	●	●		●											
STAIN-BLOCKING PRIMER (4)	●	●	●	●	●											
ALKYD-BASE METAL PRIMER (5)								●	●	●	●	●			●	
OIL-BASE METAL PRIMER (6)								●	●	●	●	●			●	
LATEX METAL PRIMER (7)								●	●			●			●	
PORTLAND CEMENT PAINT (8) (FOR METAL)								●	●							
MASONRY SURFACE CONDITIONER (9)						●	●									
PORTLAND CEMENT PAINT (FOR MASONRY) (10)						●	●									
ALKALI-RESISTANT COATINGS (11)						●	●									
IRON OXIDE PRIMER (12)																●
NO PRIMER NECESSARY (13)														●		
TOPCOAT MATERIAL USED FOR PRIMER (14)						●	●									

OUTSIDE TOPCOATS	OUTSIDE PRIMERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14
OIL-BASE GLOSS HOUSE PAINT	●			●		●			●			●		
OIL-BASE FLAT, EGGSHELL HOUSE PAINT	●			●		●			●			●		
BARN PAINT	●			●		●			●			●		
ALKYD HOUSE PAINT		●		●	●				●			●		
ALKYD TRIM ENAMEL		●		●	●				●			●		
LATEX FLAT HOUSE PAINT			●	●			●		●			●		
LATEX TRIM ENAMEL			●	●			●		●			●		
CLEAR FINISHES													●	●
SEMITRANSPARENT STAIN													●	
SOLID COLOR STAIN													●	
ALKYD-BASE MASONRY PAINT									●					●
LATEX MASONRY PAINT									●					●
ALKALI-RESISTANT COATINGS									●		●			
PORTLAND CEMENT PAINT (FOR MASONRY)										●				
SILICONE WATER REPELLENT COATING													●	
OIL-BASE EXTERIOR METAL PAINT						●						●		
ALKYD-BASE EXTERIOR METAL ENAMEL					●							●		
ALUMINUM PAINT					●									
PORTLAND CEMENT PAINT (FOR METAL)								●						
BITUMINOUS ROOF COATING													●	
COLORED ALUMINUM ROOF COATING													●	
LATEX PAINT (FOR ROOF COATING)													●	

and door frames—spots often neglected but very important—to see that the caulking there is sound.

Make one final trip around the house, looking for loose or popped nails, and for nails which have rusted and bled under the present paint. Drive in loose nails, and drive new nails near them as reinforcement. Use the wire brush to scrape clean areas where rust has bled through the paint, and prime the area to seal against further bleeding.

Now, with all of this done, you are ready to begin painting. The first question is: What kind of paint to use? The basic choice is between latex and oil-based paints. You can find advocates of both kinds, and there is no doubt that quality brands in both kinds are good.

Latex-based paints spread easily, can be applied on damp surfaces, dry faster, have little smell, and offer quick and easy cleanup using only a detergent and water. You can stop painting anywhere today and start up again tomorrow with no problems.

Oil-based paints have exceptionally good hiding power, adhere better than latex to chalked surfaces, and level better as you brush. They provide a tough and long-lasting coat. However, cleanup is more difficult, and you must use solvents.

How about using a latex now over an old oil paint—or an oil now over latex? Experts say that present-day latex formulations have a good ability to penetrate the present coat, which means that they can now be used over an old oil-base paint. That wasn't true a few years ago. Since that is the case, there seems to be no reason that you can't apply a latex over oil.

Incidentally, one reason for washing the house before you begin painting is to get rid of excess chalk on the surface. The inability to properly penetrate this chalk has been one reason the latex paints didn't work well over oil-based products. By washing, however, you give the latex an excellent opportunity to bond to the existing surface.

Having made your selection and purchased the paint, you can go to work. The fastest and easiest application is done by using both a paint roller (one with a long handle which can be attached when needed is best) and a good, 4-in. or wider brush. Use the roller to coat large flat areas. Use the brush near the edges and to coat small areas and the undersides of siding. You can also brush over the area you rolled, to assure even coating and to fill in any areas not well coated.

Use a sash-and-trim brush, which has its bristles cut on an angle, for painting windows and other trim. You'll find it easiest to begin the job by doing the windows, doorframes, and other trim.

Don't attempt to extend any exterior paint too much. Remember that you are not just coloring the wood; you are putting a protective coating on it. Therefore, apply enough paint to make a coating. If you brush it out too much, you don't leave enough paint to weather in the next couple of years, and your wall will show signs of wear and erosion rather quickly.

At the same time, don't slosh the paint on too thick. Thick paint tends to crack and peel, especially when moisture gets under it. If you believe a heavy coating is necessary, then give the house two thin coats rather than one heavy coat.

Preparing surfaces

Use this checklist:

☐ **Sound existing paint:** Remove loose dirt with dusting brush, smooth rough areas with sandpaper.

☐ **Checked, alligatored, blistered, wrinkled or peeling paint:** Scrape, wire-brush and sand down to bare wood. Chemical paint remover may be required for large areas; do *not* use a blowtorch.

☐ **Mildew** (looks like gray dirt): Scrub with solution of household bleach, laundry detergent and trisodium phosphate (wear rubber gloves and eye protection); rinse; use primer and paint containing mildewcide.

☐ **Excess chalking:** Remove with a wire brush.

☐ **Loose, rotted or damaged boards:** Replace badly damaged or rotted boards; renail loose boards that are sound, set and fill nailheads. Small cracks can be filled with wood putty.

☐ **Glossy areas of existing paint:** Sand to provide "tooth" for new paint to adhere to or apply deglossing surface conditioner.

☐ **Openings and joints:** Fill with caulking compound.

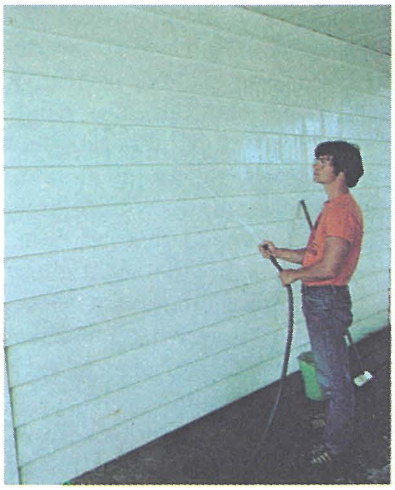
☐ **Old caulking, window putty:** Replace if dry or brittle.

☐ **Nailhead staining:** Sand area to bare wood, bare metal of nail; set nailhead, prime before filling hole.

☐ **Bleeding** (stains caused by seeping of colored matter in wood): Use stain-blocking primer.

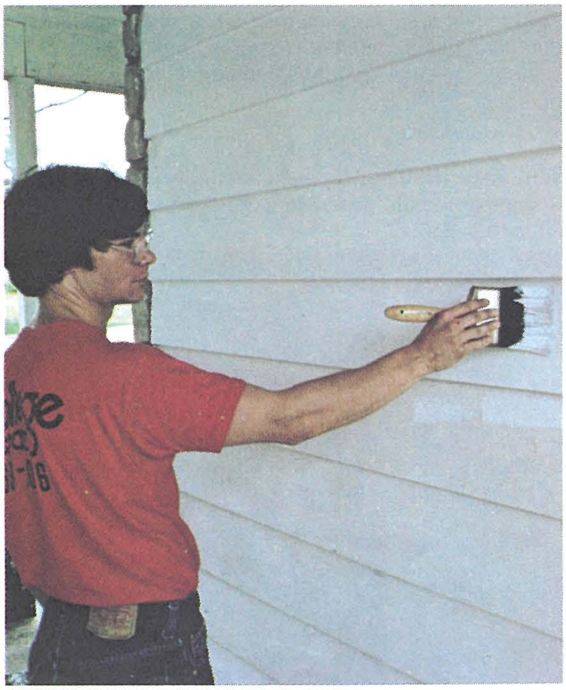
☐ **Masonry:** Remove dirt and loose material with wire brush.

☐ **Gutters and leaders:** Remove all rust and corrosion with wire brush and sandpaper; patch any holes.



GOOD PREPARATION is the key to a good exterior painting job. The first step is to wash the surface of the old paint with a TSP (trisodium phosphate) solution to remove accumulated dirt and other deposits. Areas which have been protected, such as the walls or porches and the undersides of eaves should be scrubbed with the solution. Next, go over the entire surface and scrape away all loose, peeling or flaking paint.

A GOOD TECHNIQUE for painting the outside of a house is to use both a brush and a paint roller. The brush can be used for painting the bottom edges of siding and for edging.



THEN THE ROLLER is used for covering large flat areas. Finally, the brush can be used a second time, to brush out areas previously covered by the roller. This technique is fast.

PAINTING WINDOWS and trim takes time, but the final appearance depends on doing the job well. Use a trim brush with angled bristles. After scraping, apply a coat of primer to cover the scraped areas, then apply the final coat of house paint.

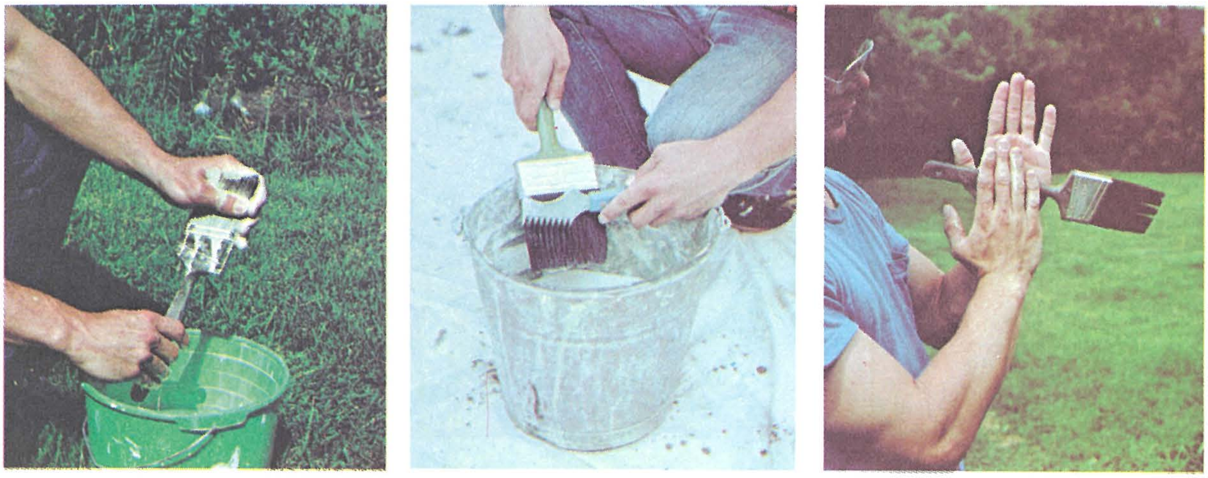
One problem occurs when homeowners thin out the paint before applying it. Most housepaints today have been designed to be used as is, right from the can. Don't thin out latex paints with water, and only thin out an oil-based paint when the directions tell you to. And even then, be sure to use the specified thinner (absolutely no substitutes) in the recommended proportions.

Generally speaking, you should expect about 400 sq. ft. of coverage per gallon of paint. However, the coverage differs somewhat according to the formulation, so check the label of each brand as you shop for your paint.

Also, the coverage will depend on the overall condition of the existing coat. If it has weathered to the point that there is little of the original coat left, then the wall will act like a sponge. In cases like this, you may get as little as 200 sq. ft. of coverage from a gallon. If, on the other hand, the present surface is good, smooth, and well-covered, you may get considerably more than 400 sq. ft. from a gallon.

ROLLERS AND BRUSHES will last a long time if you clean them properly after each use. Always scrape the excess paint from a roller before washing it. Then wash it in clear water, working the paint from the nap of the cover with your fingers. Keep washing until the paint is out of the nap, then shake or spin excess moisture from it. Finally, stand it upright for drying.

TO CLEAN A BRUSH, first rinse the paint out of the bristles in a solvent (water if the paint is latex), then use a brush comb to clean hardened paint from the area around the ferrule. When all signs of the old paint are gone, spin out the excess moisture by rotating the brush between your hands. Then wrap it for storage.



'Tin-can' septic field

What's your opinion of my idea of using crushed aluminum cans to form a drainage or effluent field for a septic tank? Or do I hear you laughing?—R.H. Friedlund, Hanover, Mich.

No, you don't hear me laughing! Good or bad, a new idea is refreshing. But by the time the idea is assimilated, the questions intrude: Do you need such a system in the almost universal sandy soils of your state? How do you propose to crush the cans—and into what shape or shapes? What happens to the crushed cans after they are buried in the field? Will they settle appreciably in time, requiring fill? Will your local or state health authorities approve such change from current practice?

I don't have the answers, but you should try to get them before beginning such a project. Also, it should be pointed out that aluminum cans have recycling value, which you will negate if you bury them.

Planning savings

If you have any questions about what energy-saving home improvements can mean to you in dollars and cents, a good source of answers is *In the Bank . . . or Up the Chimney?*, a new, 72-page book published by the Department of Housing and Urban Development. It gives clear, detailed instructions on insulation, storm windows and weatherstripping—and lets you know which improvements *won't* make sense in money terms for *your* house.

The book can be used anywhere in the Continental United States (including Alaska). Order it as stock No. 2300-00297 from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Make out your check or money order for $1.70 payable to Superintendent of Documents and allow five weeks for delivery.

No flowers

Two years ago we planted a wisteria vine which has grown quite well but never flowered. It's in a well protected location and has been cared for as recommended at the time of planting. Can you tell us why it doesn't flower?—F.M., Ohio

Perhaps you are in too great a hurry. It's just possible your plant hasn't reached the flowering stage yet, especially if it originally was a seedling and not a grafted plant. Although it hardly seems likely in your locality, it is possible that the buds have been "winter-killed." At any rate I would suggest you give it another season's growth before deciding on a replacement.

Nails that pop

My five-year-old home is finished inside with a plasterboard or other drywall. In some places along the joints the nailheads are actually lifting the putty. This is causing bumps or dimples to appear under the wallpaper in one room and it's exposing the nailheads on the painted walls. What's happening, and is there a cure for this condition?—S.G., Ont., Canada

Nail popping in drywall construction poses a knotty problem. The usual causes are careless workmanship, incorrect nailing techniques, framing lumber that is warped or that shrinks or warps as it dries and, less common, conditions peculiar to the structure or location.

If you do the repairing yourself, don't pull the popped nails. Instead, carefully chip away any loose putty around each nailhead and drive two nails in line with the joint, on opposite sides of the popped nail and about ⅜ to ½ in. away from it.

Use the ringed or threaded nails that are made especially for drywall installations. Drive in the new nailheads until they form slight "dimples" in the papered surface of the plasterboard but be careful not to break through this surface. Then use a large pin punch to reset the popped nails. Fill all of the dimples and holes with a drywall joint compound and trowel them flush with the plasterboard.

Vent area for crawl space

How can I estimate the proper vent area in a crawl space?—P.T., Okla.

The FHA says: "At least 4 foundation wall ventilators shall be provided, one located close to each corner of the space, having an aggregate net free ventilating area not less than 1/150 of the area of the basementless spaces . . ."

Condensation woes

Despite storm sash on all windows in my home (all storm windows are on hangers with hook closures), some windows sweat while others stay clear. On some the storms sweat; on others the inner glass is fogged. Why is this, and what can I do about it?—Robert Mayer, Northfield, Mass.

If the inner sash leak warm air, then outer ones sweat, as you say. If the reverse is true, then the inner ones sweat. The remedy is a tighter fit of either the inner or the outer sash on each sweating window. Weatherstripping on the inner sash and turnbuttons on the outer ones will usually do it, or at least reduce condensation to the point where it is no longer objectionable.

by W. Clyde Lammey

A GOOD wire brushing is needed to clean previously painted surfaces before applying new coat.

HOSE DOWN the surface after wire brushing or washing with a detergent-and-water solution.

WASH THE SURFACE with a detergent-and-water solution to get rid of any oil or grease.

How to protect exterior concrete and metal

By LEN HILTS

The real secret of applying a protective coating over metal or concrete is in the preparation. Take the time to do it right

LET'S TAKE THE MYSTERY out of painting exterior metal and concrete surfaces. There is no reason why applying protective coatings to these surfaces should baffle or confuse you.

Good preparation of the surface is the key to success, and is more important here than in any other painting work. The reason is that there can be a lot of activity going on under the coating which can effect both its adhesion and its appearance. Metal, for example, may rust and bleed. Concrete and other masonry may exude alkali. But none of this activity need be troublesome if you prepare for it.

Metal preparation: Ornamental railings, lampposts and other metal objects rust in contact with moisture. This can occur under a coat of paint, and when it does, the rust bleeds through the paint to create an exterior stain. It also can interfere with adhesion and cause flaking.

To avoid rust problems, use a three-step procedure. First get rid of all the old rust, dirt and other accumulated gunk. The best way to do this is go over the surface thoroughly with a wire brush. Keep brushing until you are down to clean metal.

The second step is to apply a good metal primer and allow it to dry. The primer seals the surface against moisture and helps to prevent rust. Be sure to coat all surfaces, including the undersides, which often are overlooked. For the third step, apply a finish coat of any good latex or oil-based paint.

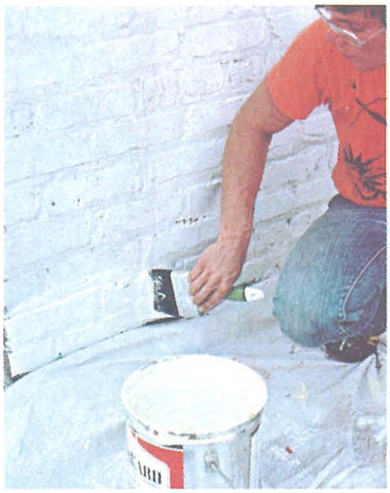
A special note on gutters and other galvanized steel items: When new, these have oils on their surfaces applied during manufacturing which prevent good paint adhesion. These will weather off in six months to a year or you can clean them off by wiping all surfaces with vinegar or mineral spirits.

Masonry preparation: Concrete and mortar are very alkaline, and alkali is the enemy of many paints. When new, these materials have alkali on their surfaces, which in time washes away. However, if moisture is present, new alkali will work its way to the surface for a long time. For this reason, it is important to use alkali-resistant paint on most exterior masonry surfaces. Read the label carefully before you buy. Most latex paints are inherently resistant to alkali, and those designed specifically for use on masonry

SEE ALSO

Concrete . . . Concrete blocks . . . Ladders . . . Paintbrushes . . . Paint rollers . . . Railings . . . Scaffolding

A SOFT lamb's-wool roller is good for applying latex paint to large masonry surfaces.



USE A BRUSH to paint corners and near edges, and a roller to speed up coverage of large areas.

WHEN USING a roller, don't roll out coating too much. Be sure coverage is complete.

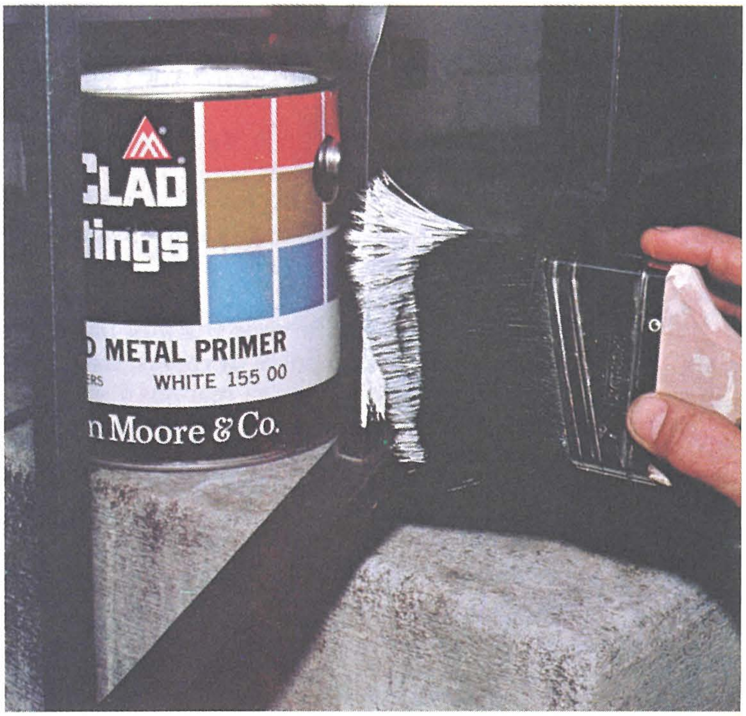
are usually safe buys. On the other hand, alkyd emulsions are not alkali-resistant, and may fail.

Other types of paint include Portland cement paint and solvent-thinned rubber-based paints. In each case, however, read the label to see that the paint is designed for your application—and also to learn the correct method of application.

Regardless of the type of paint used, preparation of the surface is the same. Use a wire brush to knock off dirt and loose particles. Then wash with a detergent and water solution to get rid of grease and oil, including release agents often found on new concrete block. Then apply the coating, but not before noting on the instructions whether the paint should be applied to a dry or moist surface. If a moist surface is required, hose off the area to be painted before applying the first coat.

A THOROUGH WIRE BRUSHING of metal surfaces is essential to get rid of old rust. Keep brushing until you are down to bright metal, then prime.

A GOOD PRIMER, made specifically for priming metal, seals the surface against moisture and thus prevents later rusting and bleeding.



A THOUSAND different colors are available to you on the selection rack at your nearby paint store.

AFTER YOU have selected the color you want, the paint store clerk custom mixes it for you.

What you should know about wall paint

Today's wall paints are easy to use, long lasting, and available in literally thousands of colors. Know how to select the right one

By LEN HILTS

■ THE QUICKEST, EASIEST and least expensive way to give your home a bright, fresh, clean appearance is to paint the interior walls and ceilings. Thanks to the paints and enamels now available, you can do a whole room in one easy day—and that includes laying down drop cloths and moving furniture. If you push, you can probably do a couple of rooms, and if you enlist the whole family—a real possibility with modern easy-application paints—you can paint everything in sight.

Selecting the paint to use in each room isn't difficult. Simply ask yourself two questions: What color do we want? And, what kind of wear will each surface receive?

Color selection. Once upon a time, each paint maker put out two dozen new colors each year—and the fashion of the day dictated what most of those would be. You may remember the year when forest green was big in living rooms, for example, or the years when pastels were the "in" thing.

Today, however, nearly every paint store can provide more than a thousand colors—almost instantly. You select the color you want from an amazingly comprehensive chart, wait less than five minutes while the salesman adds the pigments to a can of base white and puts the can on a mixing machine—and then you're ready to put the roller to the wall.

This system is both good and bad. Good because you have unlimited choice. Bad because

SEE ALSO

Home improvement . . . Paintbrushes . . . Painting, exterior . . . Paint rollers . . . Remodeling . . . Wall decorations . . . Wallpaper

an unlimited choice makes the final selection so difficult. It's like choosing an ice-cream cone at one of those places with 31 flavors, 29 of which you like.

Good advice on color selection. Keep your rooms on the bright, cheerful side. The less light that enters the room, the more reason you have to put lighter colors on the wall. Coordinate the colors of the paint with your furniture and carpeting. If you contrast the walls with the furnishings, rather than blending them, you'll probably find the combination tiresome at an earlier date. And finally, decorators advise making the woodwork the same color as the walls in most cases.

Surface wear. The second question—what kind of wear the surface will get—is equally important. Kitchen and bathroom walls get a lot of scrubbing. Bathroom walls often are bathed in moisture which leaves deposits. Kitchen walls accumulate grease from cooking. Kids' rooms get the crayon-fingerpaint-chocolate handprint treatment pretty often. Living rooms, dining rooms and adult bedrooms get some surface dust, a few scrape marks, and fingermarks, but in general, take less of a beating.

The secret of buying a long-wearing interior paint is this: the harder the surface of the paint, the easier it is to wash—and the longer it will stand up under repeated washings. And the best measure of surface hardness is the gloss of the paint.

Flat wall paints are the softest; semi-gloss paints are harder; high-gloss paints are the hardest. In simple terms, dirt can't dig in and get a grip on a glossy surface, so it washes off easier.

Glossy paints and enamels, however, tend to show up uneven spots and other imperfections on a wall or ceiling. Therefore, most people settle for semi-gloss rather than glossy coatings, even in kitchens and bathrooms. One variation on this is the so-called "wet look" popular with some decorators. This is achieved by using very high-gloss paints.

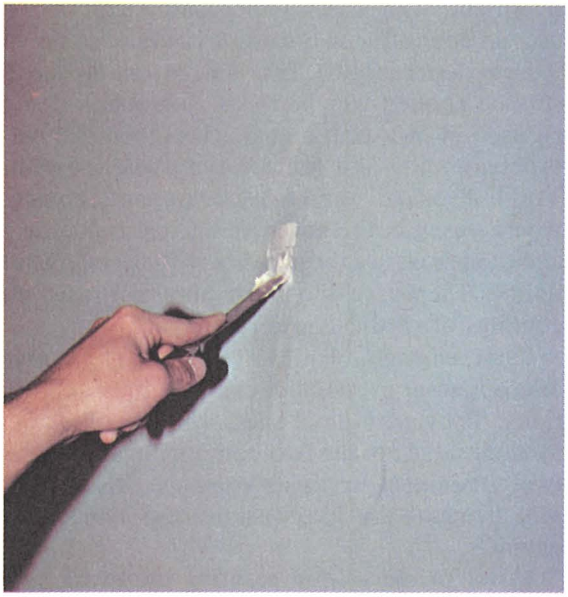
So, when selecting paints, look to the glossies and semi-glossies for the kitchen, bathroom, and laundry room. The semi-glossies will perform well in children's rooms and in halls which have high traffic. The flat paints are fine for normal living areas.

Types of paint. Basically, there are two types of paint—water-thinned and solvent-thinned. At the paint store today, you'll find two predominant wall coatings, the latexes and the alkyds. The latexes are water-thinned, and the alkyds are solvent-thinned.

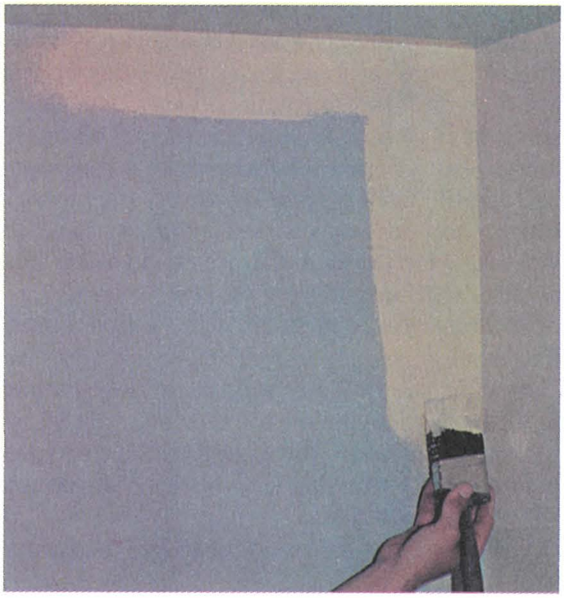
Latex paints. There are three types of latex paints on the market—rubber, vinyl and acrylic. All are water-based. You wash your rollers and brushes in water after you use them. Rubber was the original latex, and now has been generally replaced by the vinyls and acrylics. All are good.

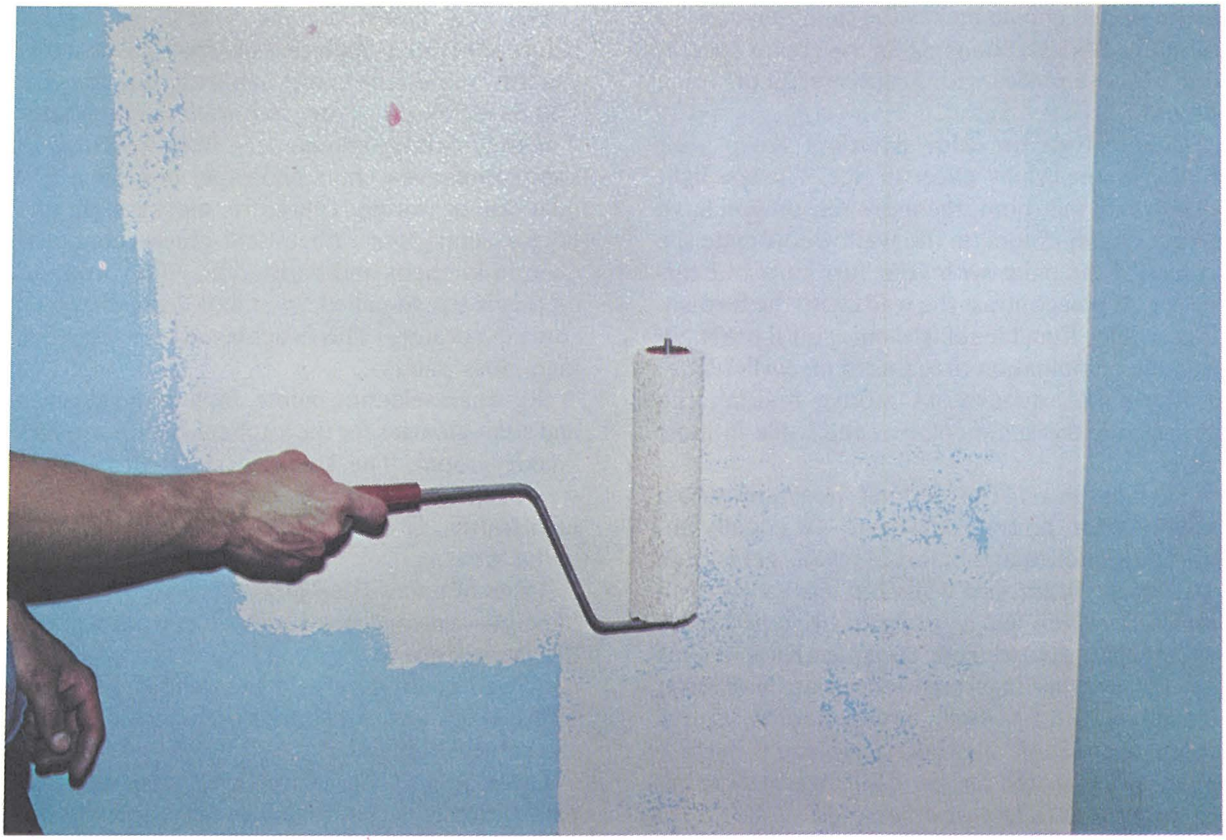
At first, latex paints were simply flat wall paints. But now, flat, semi-gloss and glossy

BEFORE YOU PAINT, go over the entire wall and check for cracks and holes. Use plaster and a putty knife to fill these. Let them dry, then sand.



USE A GOOD BRUSH to "cut in" at the corners and at the point where the ceiling joins the wall. Then use a roller to coat the open wall areas.





THE REAL TRICK in using a paint roller is to spread the coating evenly. Best way to begin is to make a "W" with the fully-charged roller. Then go back and forth over the "W" to spread an even coat.

latexes are available, along with latex enamels. You now can do your whole interior in latex, regardless of the wear problems—and this includes latex enamel for the woodwork.

The latexes are fast drying, cover very well, don't have a painty smell, and clean up easily with water or a damp cloth.

Alkyd enamels. The alkyds are resin-based, take at least four hours to dry, and thinning and clean-up must be done with solvents. They have some smell, but not as much as the old oil-based paints. This all makes them somewhat less popular than the latex paints. However, they form a tough, non-porous surface, tougher than the latexes, which makes them easy to wash and able to withstand more washings.

So there you have it: latex and alkyds all in flat, semi-gloss, and gloss. Select the type that suits your needs. To repeat: latex is easier and quicker; the alkyds are tougher and take more washings and wear. But keep in mind that latex paints are *very* washable, while the alkyds are *very, very* washable.

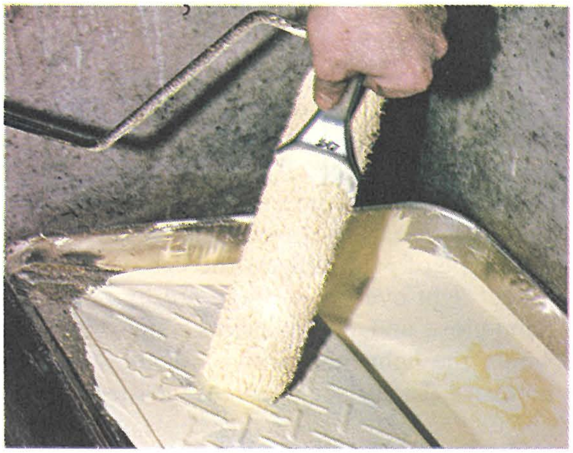
Other types of paints are available for special wall applications:

Enamel undercoaters. These come in both latex and alkyd. These are used for priming bare wood surfaces, such as new woodwork, before final painting. Most undercoaters are white. They should be tinted before you use them under colored enamel. Alkyd undercoaters must dry overnight, while latex undercoaters can take a second coat after two to four hours.

Epoxy ester enamel. This is an extremely tough surface coating which resists abrasion and can be used in high-traffic areas. Use them for real problem walls and not for the average room. You'll also find some two-component epoxies, where you mix the components just before use and then must use the mixture within a couple of hours. These are the most abrasion-resistant coatings of all those generally available.

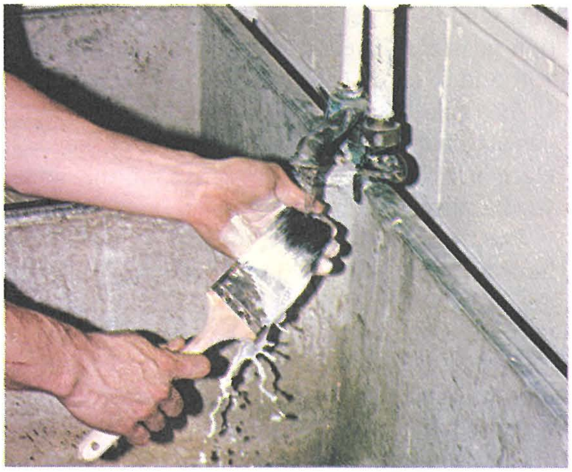
Floor enamels. Today's floor enamels give amazing wear even under constant traffic conditions. They may have special needs on walls. Most durable are the two-component epoxy and two-component urethane enamels. Not far behind them are the epoxy ester and polyurethane enamels.

Metal primers. For painting ductwork and

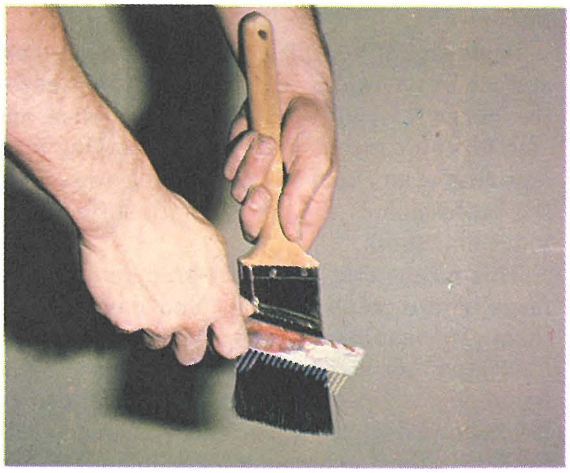


A ROLLER SCRAPER is a handy tool for roller cleaning. Use it to help work all paint residue out of the cover. The scraper is inexpensive.

PUT THE ROLLER under the cold-water faucet in the laundry tub to wash the paint out of it. Keep washing until the roller cover is paint-free.



LATEX PAINT washes out of a brush under the faucet. Work the brush with your fingers under the running water until all paint traces are gone.



FOR STUBBORN PAINT, use a brush comb. It helps to get paint residue out of the center of the bristles and from the area near the ferrule.

AFTER CLEANING and combing the brush, restore its original shape with your fingers. Work from the ferrule toward the tip as you press and shape.

WRAP THE BRUSH while it is still moist. Use the wrapper the brush came in, draft paper, or aluminum foil. Hang it, bristles down, for storage.

other metals, a metal primer is necessary. You'll find both alkyd and latex products available. The latex is easier to use, but you must use a moisture-impervious topcoat with it. A latex enamel over a latex primer on metal won't work. Moisture can get through both coats so you won't get good adherance or good rust protection.

The alkyds give good base protection. Read the label of the product you buy—and use the recommended topcoat material. Paint formulations vary so greatly that it is possible to buy two paints of the same class made by different manufacturers and find one incompatible with the other. This could mean early peeling or flaking.

Drywall latex primer. A good latex paint is the best primer to use on a new drywall installation. It will not raise the fibers of the paper coating on the drywall, which a solvent-thinned primer will do.

Deglosser. If you plan to paint over a glossy surface of any kind, remember that the reason the surface is glossy is that it is dense and smooth. This means that there is nothing for a new coat of any kind of paint to get a grip on. As the professionals say, the smooth surface provides no "tooth."

This means that you must prepare such surfaces before painting them. You must degloss them. This can be done by sanding the surface lightly but thoroughly—or by applying one of the liquid deglossers available at your paint dealer. If you don't degloss the surface, you are likely to get poor adhesion and much peeling of the new paint.

time limit between coats

When applying a glossy enamel (planning on two coats), be sure to read the directions on the can. In many cases, the directions set a time limit between coats. That is, you must apply the second coat within so many hours of the first. If you wait longer, then you must degloss the first coat before applying the second.

The problem of light reflection. Do you want to make the most of the natural and artificial light in a room? Or do you have a glare problem, with a lot of sunlight coming through big windows? You can control the room light through the use of paint on the walls and ceiling.

Begin by remembering the basic rule that dark colors absorb light and light colors reflect it. When deciding on the color for any room, consider the light present and be influenced by it. Do you want to tone down the light or add to it? Try to keep the room bright and cheerful, but avoid spots that glare.

Your paint dealer can show you a light-reflectance table, which will tell you the light-reflectance percentages of different colors of paint. For reference, 100 percent reflectance is the light reflected from a mirrored surface.

In addition, you should think about the *way* each type of paint reflects the light. Flat paints reflect light evenly, so there are no hot spots. Semi-gloss and glossy paints show hot spots where the light hits them—with the light spot hotter as the surface becomes glossier.

ceilings reflect light

Generally, ceilings are one of the most important reflected-light sources in any room. One of their functions is to spread the light in the room evenly. For that reason, most people paint ceilings white—to get the highest amount of reflection possible. They also use a flat paint to get a soft and even distribution of the light.

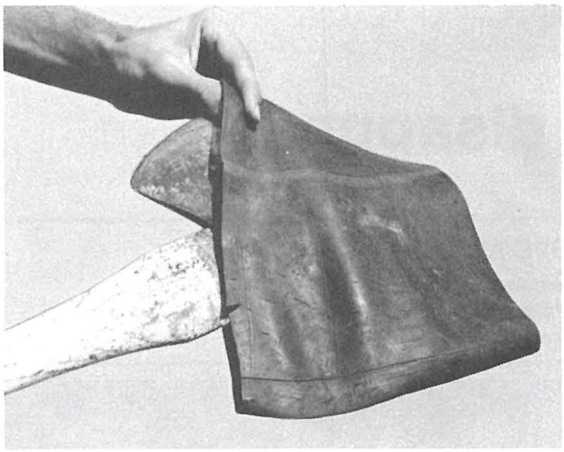
As a rule, the ceilings in bathrooms and kitchens are coated in semi-gloss in spite of the slight glare problem, chiefly because of the added washability of the semi-glosses.

Painting new walls. If your home is new, or you have put on a room addition, you may be painting walls which haven't been painted before. If you have plastered walls, be sure to allow the plaster to cure—allow it to dry for at least three months—before you put on the first coat of any type of paint. After curing, any alkyd or latex coating is fine.

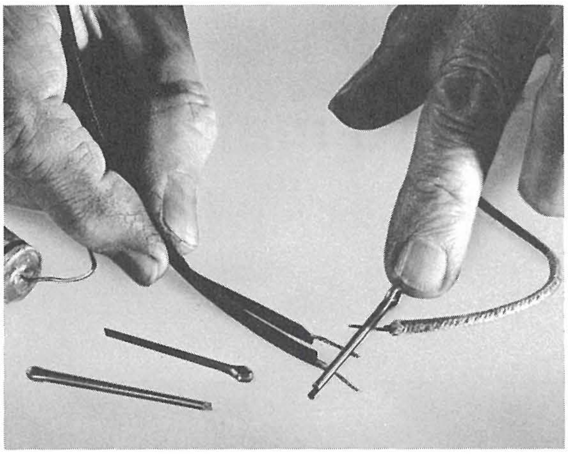
If the new walls are gypsum wallboard, you can paint them shortly after the wallboard has been put up. Allow the taped joints to dry for a day or two, then use a good latex primer, followed a couple of hours later by a latex wall paint.

Painting acoustical tile. Ceilings of acoustical tile can be painted. The acoustical properties of the tile depend on the rough surface and on a number of tiny holes in the tile surface—both of which deaden the sound. The goal, when you paint ceilings like this, is to get new color without filling the holes or destroying the rough surface.

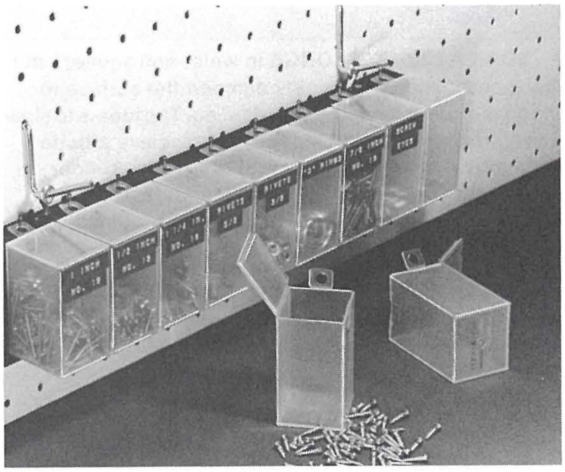
You can buy paints made especially for the purpose. You can also thin down a flat latex paint for a satisfactory job. You'll find the thinning formula on the label of most latex paints. Alkyd formulations also can be thinned for this use, but be certain to use only the recommended thinner. The wrong thinner may result in a big can of curdled and useless paint!



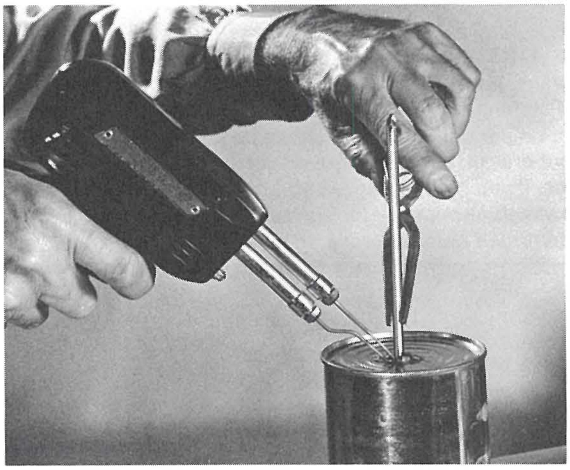
A SHORT LENGTH of inner tube pulled over an axhead keeps the cutting edge sharp and prevents accidental cuts and gouges where they are not wanted. And, since the tube seals off air, rusting is kept to a minimum and the edge stays bright. Conventional tubes work for most axes but a double-bitted ax will require a larger one.



AN ORDINARY COTTER PIN can be put to another use as a handy tool in your workshop. Used as a clamp (see photo above) when you are testing low-voltage circuits, it saves you the chore of twisting and untwisting the wires. A large pin will do the job best; it holds the wires securely, yet permits fast insertion and removal of the strands.



STORING THOSE PESKY, but often needed, small parts won't be a problem if you build this handy rack. Though the one shown holds 10 of the commmercially available plastic containers, by varying size of board to which they're attached, any number can be used. The board can be permanently fastened or fitted for perforated board mounting.



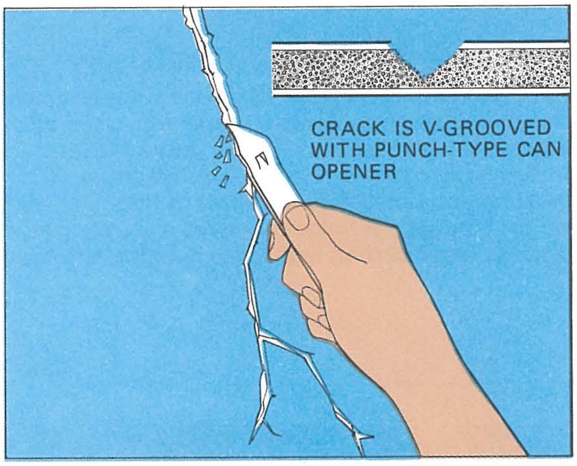
ORDINARY TIN CANS can serve as flower vases for the back yard, patio or cemetery grave. To prevent a can from blowing over, solder one or more large nails to the bottom. When pushed into the ground, the vase will be well anchored. To decorate the tin can, use colored metal foil or other weatherproof wrapping or paint with outside enamel.

A PROPERLY BROKEN-IN saw chain lasts longer, says a spokesman for Omark Ind. The saw-chainmaker says to soak the new chain in oil, put it on the bar and adjust tension. Next, run the saw at idle speed to line up the chain with the bar groove and sprocket and make a few easy cuts at half throttle. Stop the saw and, after it cools, re-tension and re-oil.

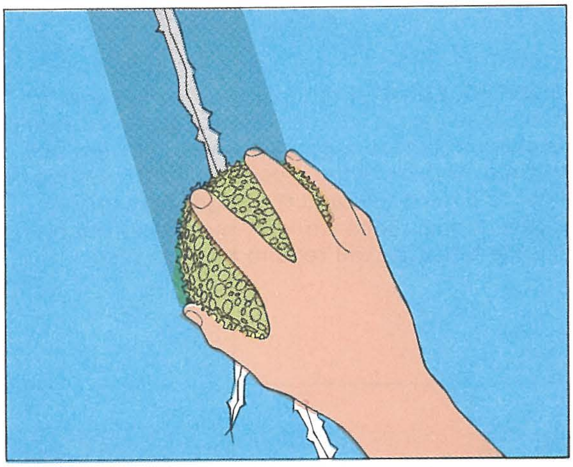
How to make cracks disappear

SEE ALSO

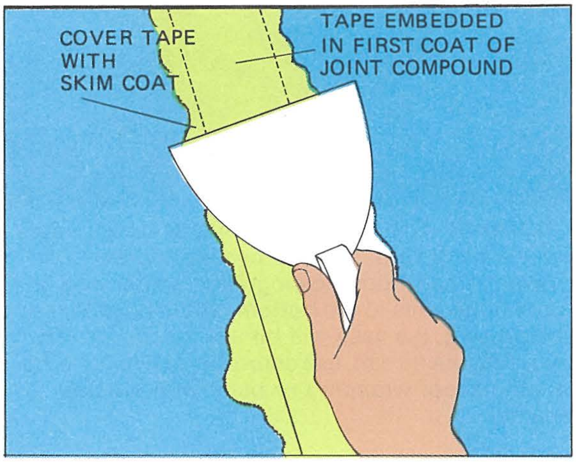
Basement waterproofing . . . Hardboard . . . Paintbrushes . . . Paint rollers . . . Plasterboard . . . Remodeling


CRACK IS V-GROOVED WITH PUNCH-TYPE CAN OPENER

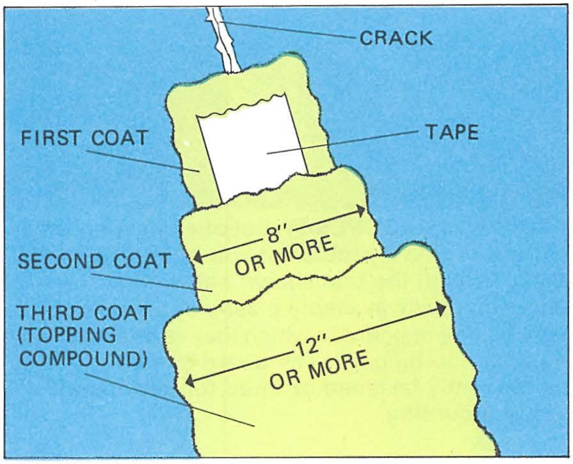
1 **FIRST PATCHING STEP** is to clean out the entire crack, making certain no loose particles remain. (Patching compound must be applied to a solid surface to be permanent.) Paint stores sell tools for gouging out cracks, but a punch-type can opener does the same job. If you're repairing plasterboard, you may have to cut away some paper on the surface. Dust off the crack with a dry brush before proceeding.



2 **SOAK A LARGE SPONGE** in water and squeeze out the excess. Then thoroughly dampen the surface to which the joint compound will applied. The idea is to slow down moisture absorption and thus achieve a better bond between new material and old. To keep floor or carpeting underfoot free of damage during repairs, spread layers of newspaper to catch the scrapings, water and compound that will fall.

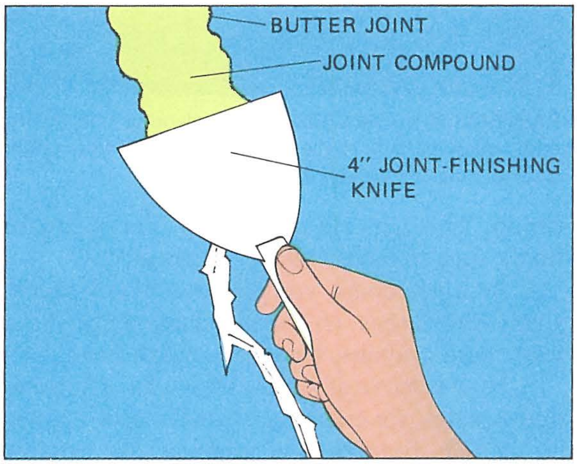

COVER TAPE WITH SKIM COAT
TAPE EMBEDDED IN FIRST COAT OF JOINT COMPOUND

5 **WHEN THE ENTIRE CRACK** has been covered with tape, take your wallboard knife and firmly press the tape into the bedding compound with knife held at a 45° angle. You'll know that the pressure is correct if you squeeze out some compound from under the tape—*but enough must be left for a good bond.* When it's dry, if air pockets (bubbles) have formed under the tape, cut them out with a sharp razor blade.

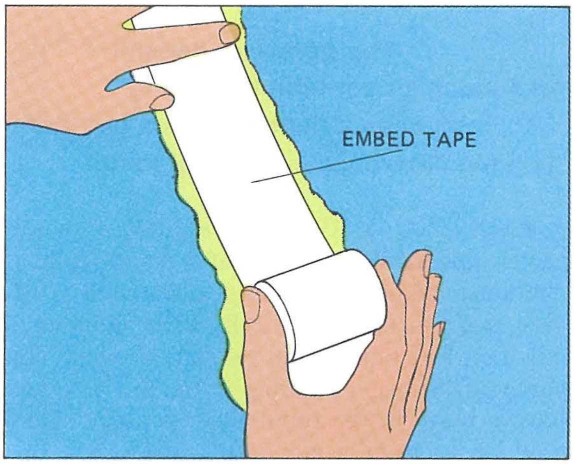


6 **A MINIMUM OF THREE COATS** is recommended for all patches—the embedding coat and two coats over the tape. The last coat can be a topping compound; it's extra smooth. Successive coats are progressively wider. Allow each to dry thoroughly before applying the next. Check between coats and sand off any high spots. If you are patching plasterboard, be careful that you *don't oversand* the adjacent paper surfaces.

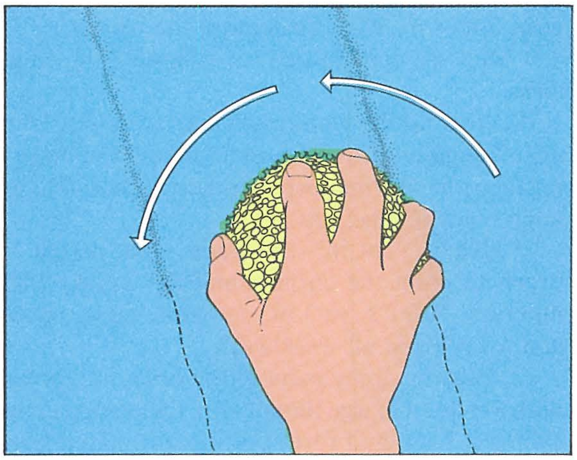
■ ANY PAINT JOB is only as good as the surface preparation that went into it. In most cases—on inside jobs—this is not much more than a thorough surface cleaning before applying paint. But as a new home settles with age, cracks are sure to appear on the walls, especially if they're plaster. And cracks can show up in plasterboard walls too. Regardless of how they got there in the first place, the chore is to eliminate them for good before you dip your brush or roller in the paint. As you'll see on these pages, you can. Some of the tricks have been around awhile; others are those used by professionals. Now, you can add them to your bag.



3 WHILE THE GOUGED SURFACE is still moist, apply the joint compound, forcing it into the cracks. You can use a dry compound that requires mixing with water, but to save time, a premixed compound is recommended. It comes in quart, gallon and 5-gallon sizes and, if kept covered and protected from freezing, lasts indefinitely. After buttering the cracks with the compound, carefully smooth off the surface with the knife.



4 APPLY WALLBOARD TAPE to the buttered crack. Using your fingers, loosely press the tape in place. Basically, there are three types of tape you can use: heavy paper (one with perforations and one without) and a gauzelike material that is available at many paint stores. All do the job, but if you are patching plaster, gauze is the best. If desired, paper tape can be moistened slightly before it is applied.



7 WHEN DRY—at least 24 hours after applying a topping coat—-the surface can be sanded to feather into the adjacent surfaces. One good way is to "sand" with a damp sponge. Since the joint compound is water soluble, don't get the sponge too wet and don't rub continuously in one spot. This method of "sanding" prevents your breathing fine sandpaper and dust and eliminates most dusting and cleanup afterward.

8 AFTER THE PATCHED AREA has been sanded, the compound and the wall surface should be primed with a suitable sealer (vinyl or oil base primer/sealer, or shellac) to equalize the (paint) absorption difference between the existing wall and the joint compound in the old crack. You should now have a uniform surface texture ready for final decoration. Just follow the instructions supplied by the paint maker.

The right way to paint a room

By LEN HILTS

The right way doesn't take much longer than the wrong way when painting a room, but there is a big difference in the final result

PAINTING WINDOW SASH goes much quicker if you first apply masking tape to the glass to protect it from paint. It takes only minutes to do.

■ PAINTING A ROOM these days is a relatively quick and easy job. Latex paints, rollers, and a myriad of helpful accessories such as edgers and plastic drop cloths have eliminated much of the labor and cut the time needed. You can actually begin painting in the morning and have a party in the room that evening. That's how far we have progressed.

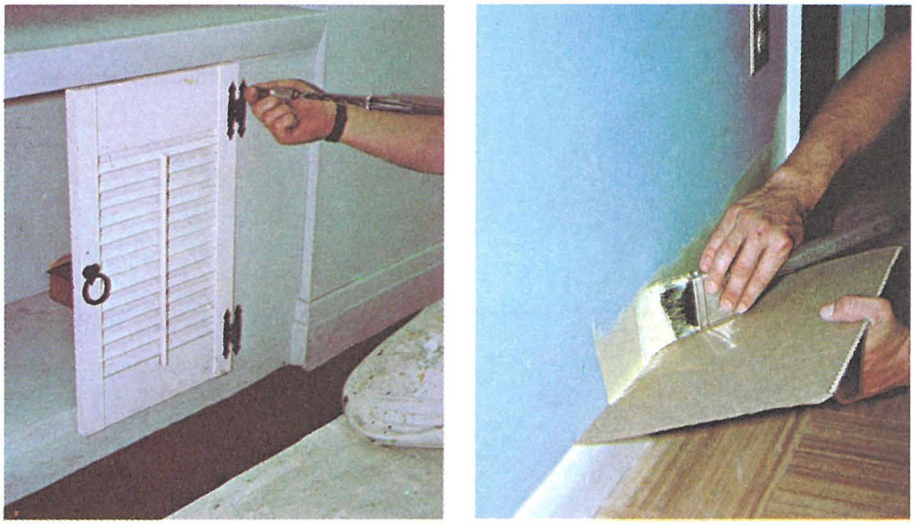
But, as usual, there is still a right way and a wrong way to do the job. The right way takes a little more time—but not much—and the job will look better and last longer. Here are the steps to follow to do it right:

1. Move as much furniture from the room as you can. Move the rest to the center of the room.
2. Cover the furniture and carpeting with a thin, plastic drop cloth. No matter how careful you are, paint rollers throw off tiny splatters.
3. Examine the wall for cracks, holes and other damage. Using patching plaster and a putty knife, fill these, allow them to dry, then sand the surface smooth. If the cracks are large, dig out loose plaster first. Be sure, when the patching is finished, that it is level, so it will be invisible under the new paint. Patching plasters may shrink a little as they dry, so a final top coat may be necessary to fill in the shrunken area in order to make a level patch.
4. Wipe the wall free of dust.
5. Kitchen and bathroom walls should be washed with a wall-washing compound and then rinsed. This gets rid of the thin film of grease that's sure to have built up on them.
6. In other rooms, you need wash only excessively dirty areas. (If the kids have marked the walls with crayons, be sure to wash these off.)
7. Now remove all hardware—wallswitch and outlet plates, for example. Drop the cover plates on ceiling fixtures and remove all window hardware.
8. Now you are ready to paint. Do the tough work first—which is painting the ceiling. You can do this quickly and easily if you buy a roller with a long handle. This enables you to stand on the floor while rolling paint on the ceiling. First, of course, you must edge the ceiling, painting a strip 2 to 4 in. wide all around the room.
9. Roll the ceiling area, overlapping the edge strip.
10. Now do the woodwork and windows. Use a 2-in. angular-cut sash brush for this. Put masking tape on the window panes next to the wood to keep paint off the glass.
11. Next, "cut in" the walls. That is, use a brush to paint the corners and the ceiling-wall junction. Paint 2 to 3 in. out from each corner and away from all woodwork.
12. Finally, apply paint to the open wall areas with a roller. Charge the roller in the paint pan by rolling it back and forth on the corrugated bottom. Carry it to the wall and make a W about a foot high and 18 in. wide. Then roll through the W to spread the coating evenly. Don't attempt to spread the coating too thinly.
13. With the painting done, wash your tools in water, put the hardware back in place, remove the drop cloths, and move the furniture back where it belongs. The job is done.

SEE ALSO

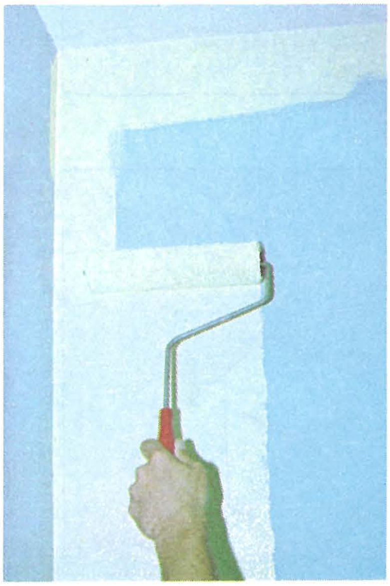
Home improvement . . . Paintbrushes . . . Painting, exterior . . . Paint rollers . . . Remodeling

PATCHING the wall before you begin to paint assures a fine, professional look when you are finished. Use patching plaster, applied with a putty knife. One good swipe with the knife loaded with plaster usually does the trick. After the patch has dried, sand the surface smooth.

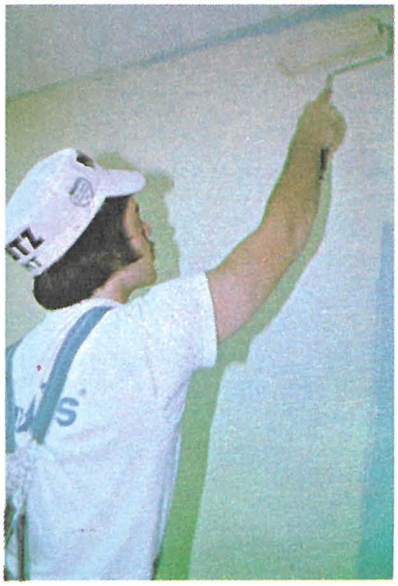


FOR A neat job, remove all hardware, including cabinet hinges and locks, outlet and wallswitch plates, and window handles. When "cutting in," protect nearby paint with a guard. You can buy metal guards or make one out of cardboard.

DO ALL of the cutting in before you begin using the roller on large areas.

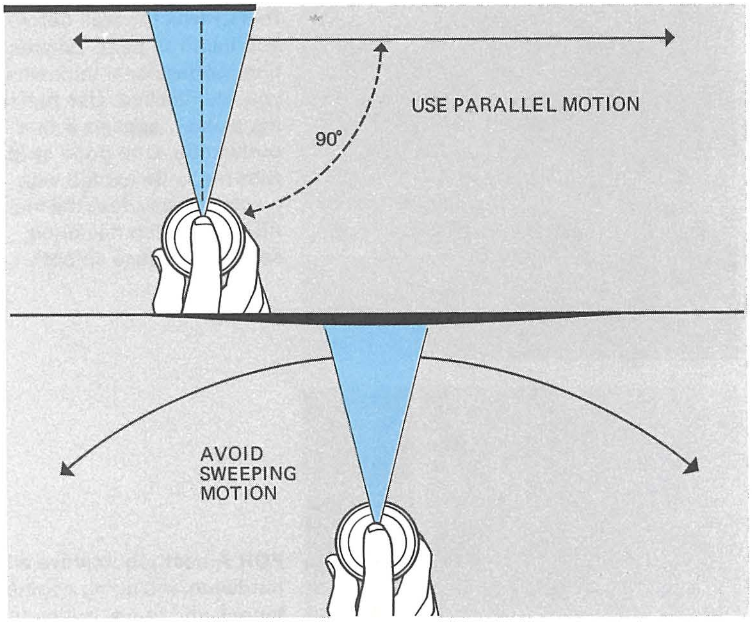


DON'T ATTEMPT to roll paint too much. Spread it to make a uniform coat.



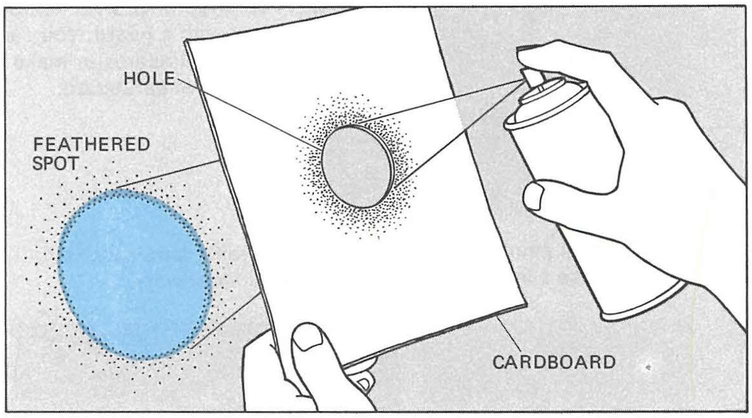
DON'T use the roller too close to the ceiling joint or woodwork.

How to paint with spray cans



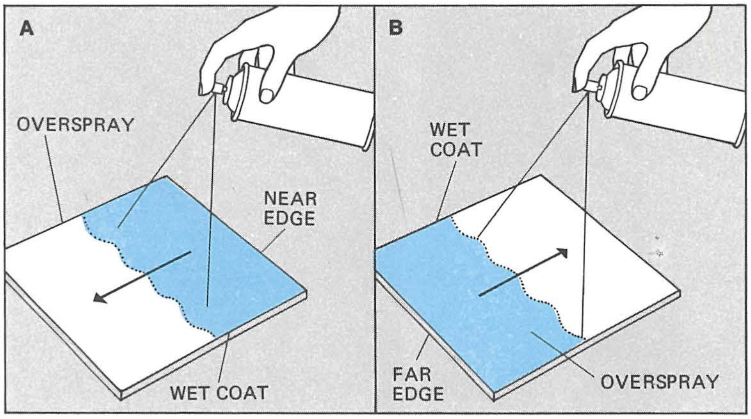
There's a knack to it

While the pressurized spray can has made painting a lot simpler than it used to be, there's a knack to handling these self-contained spray guns beyond just pressing a button. One of the secrets of a perfect paint job is to keep the can moving at all times. Another thing to remember is that the paint goes on in a uniform layer when the distance between the spray head and the surface is the same throughout a parallel sweep, as shown in the upper diagram, on the left. When applied with a sweeping motion as shown in the lower diagram, the paint film is heavy at the center of the arc and thin at each end, producing a coating which is not uniform



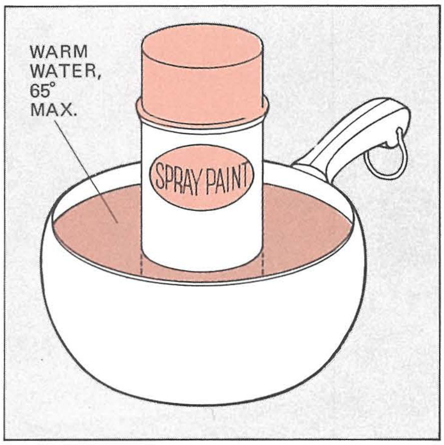
Control touch-up feathering

A neat trick to remember when doing touch-up work, such as refinishing a fender scratch, is to aim the nozzle through a hole in a piece of cardboard held 10 in. or so from the surface. This feathers the edges so the paint will blend into the surrounding area rather than concentrate in a single spot



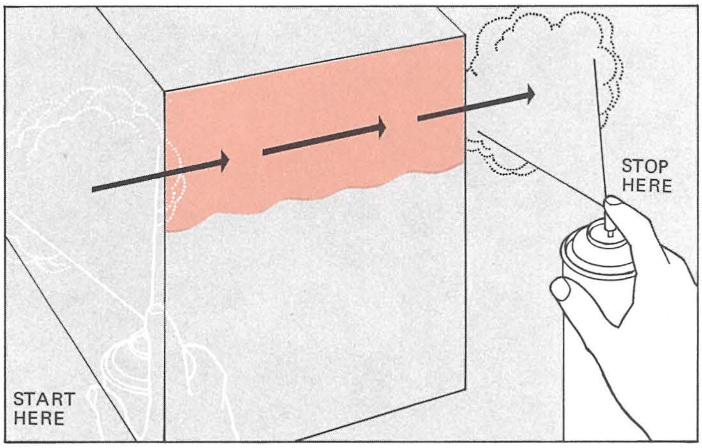
Always work from the near edge

When painting a horizontal surface such as the top of a table, start at the near edge and work away (A). This lets the overspray (mist) settle ahead of the full wet coat following. Working from the far edge (B) allows the mist to fall on top of the wet coat, producing a less smooth, "pitted" finish. Several thin coats will produce better coverage and hiding quality than one thick coat. Since aerosol paints are generally quick-drying, succeeding coats can be applied as litle as five minutes apart



Wait until paint is warm

To dry properly, paint in aerosol cans should be at a temperature between 60° and 90° F. If cans are stored in a garage or other unheated place during cold weather, the paint will be too cold to use immediately. To warm it, place the can in a pan of lukewarm water (*not* over a fire) for a few minutes



Start spraying before you paint

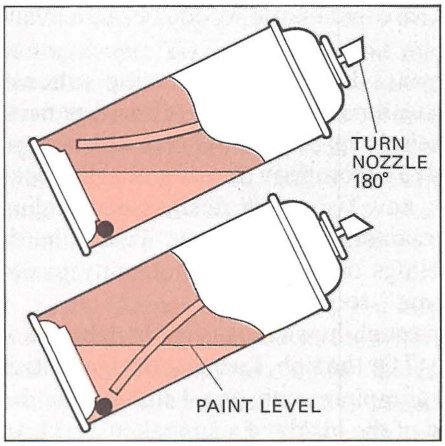
When spraying flat vertical surfaces, learn to trigger the spray so you start and stop the spray stroke off the work. This results in an even coating. Stay parallel to the surface and move back and forth across the full width of the work with each pass. Hold the spray head 10 to 12 in. from the surface and use a firmly rapid stroke. If applied too slowly, the spray concentration becomes too great and the paint will run and sag on vertical surfaces. Shake the can to keep the paint well mixed

SEE ALSO

Painting, auto . . . Paintbrushes . . . Paint rollers . . . Spray guns

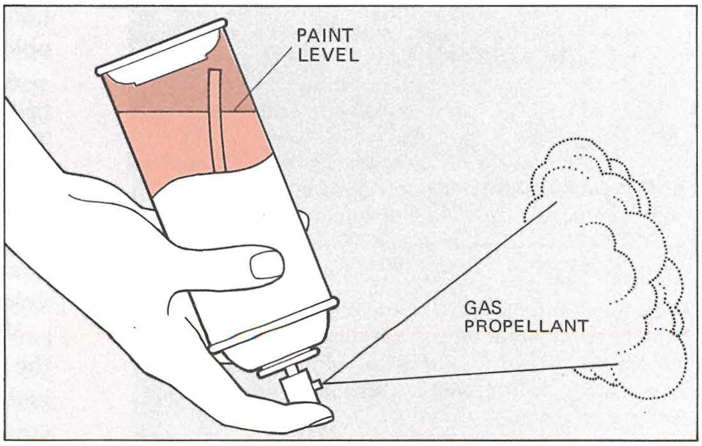
Good to the last drop

When a can is nearly empty and fails to spray when it's tilted, chances are that the siphon tube is above the paint level as shown in cutaway A. The remaining contents can be reached in most cases by turning the spray head 180° or until the siphon tube is in the lowest part of the can and below the paint level, as in B



Keep it clean when job is done

After each job, be sure to clear the spray head of the paint so it won't be clogged for the next use. To do so, turn the can upside down and give the spray a few bursts to blow out the pinhole orifice. Aim the nozzle at a dropcloth or newspaper as some remnants of paint will be forced out along with the gas. Even when emptied of paint, enough pressure is left to be a hazard. Before disposing of any aerosol can, hold down the spray head (release valve) until the remaining gas is completely exhausted



TWO TYPES of decorative hardboard paneling were used in this room, including the stucco over the fireplace.

Hardboard wall paneling

By LEN HILTS

HARDBOARD PANELING now duplicates the natural appearance, texture and color veining of clinker brick.

SEE ALSO

Basement remodeling . . . Family rooms . . . Fasteners . . . Hardboard . . . Insulation . . . Paneling, plywood . . . Paneling, wood . . . Remodeling . . . Tile, wall . . . Wall decorations . . . Wallpaper

■ ABOUT THREE DECADES AGO, the manufacturers of hardboard developed a photographic method of reproducing the look of any wood—a look so natural that new possibilities of paneling in rare and exotic woods became available.

A few years later, an embossing process brought three dimensions to hardboard panels. The embossing reproduces the feel and texture of the wood to accompany the natural color look. Since then, new types and designs of paneling have been coming out every year. Today, hardboard panelings offer a real opportunity to develop "theme" rooms.

Want the rough-hewn look of a ranch house of the old West? Or the rich, formal look of a British clubroom, complete with panel insets? Or the cool feeling of the inside of a sunbaked Mexican cantina? Or perhaps you want to decorate in French Provincial, or you are reproducing the charm of old Spain and need a Mediterranean wall.

Whatever theme you have in mind, there is a hardboard decorative paneling to help you reproduce your vision.

Hardboard decorative paneling comes in all the standard hardwoods—mahogany, walnut, cherry and oak—and in beautiful, rare exotics, ranging from pecky cypress to teak and Brazilian rosewood. You'll also find it simulating brick, stone, tile and marble, and in woods tinted in the attractive deep reds and greens of the colonial period.

The paneling is tough. It resists dents, scratches and nicks, so it looks good for a long time on your wall. You don't have to baby it.

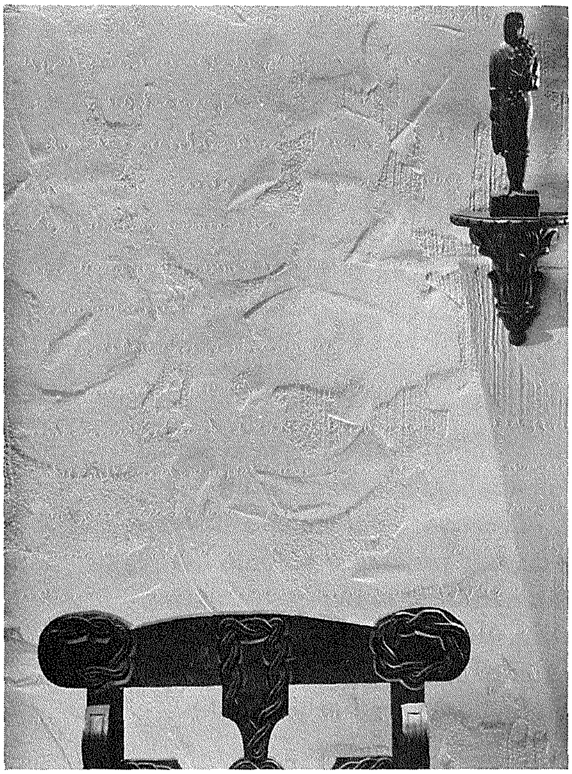
In rooms above ground, it is wonderfully easy to put up yourself, using a vinyl adhesive applied with a caulking gun. In most applications you don't have to nail, set the nails or fill the nail holes. In the basement or on masonry walls, you must first put up furring strips—but these, too, go up quickly with vinyl adhesive, and no nailing is required.

Giving the wall a professional finished look is no problem, either. You'll find a complete assortment of base, cove and corner moldings, as well as casings and stops for finishing around doors and windows. These are all prefinished, in colors and designs to fit every type of paneling. If you choose to mount your wall with nails, color-coordinated nails are available, too.

The standard panel is ¼-in. thick and 4 x 8 ft. in size. You'll also find some paneling in ⅛-in. thicknesses. The marble designs for use in bathrooms are ⅛-in. thick, and you'll find special moldings made for use with this thickness. You can even buy kits with moldings designed for installation around bathtubs.

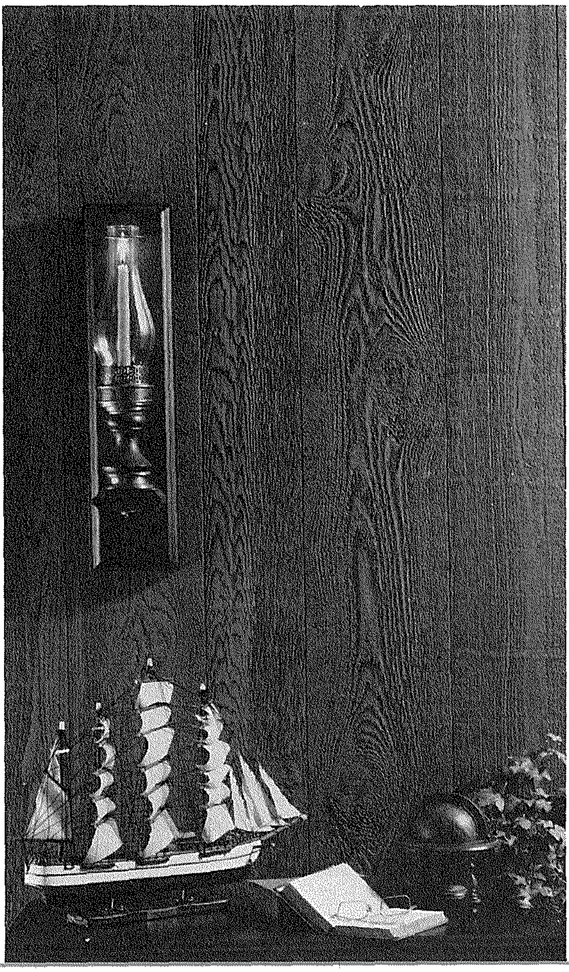
The new designs put one new burden on the homeowner: You must plan and measure your installation with care. Those panelings with regular repeat designs, such as panel insets, must go up so that the pattern occurs correctly on the wall. You don't want half an inset panel occurring somewhere in the middle of a wall. The planning isn't tricky, but it does take some thought about each wall.

Study the paneling before you buy, and measure the pattern, so you know where the panel can be cut. Then make a few sketches of your wall, in scale, to see how many panels you need, and how the design will fill each wall.



HAND-TROWELED STUCCO hardboard panels offer a dimensional texture that is hard to tell from real stucco.

THIS ROUGH-HEWN CEDAR paneling has everything the original old western boards had except the splinters.



How to work with plywood paneling

One of the surest ways to succeed in remodeling or redecorating is to recover your walls with wood. Paneled walls provide a surface that is compatible with every decorating style. New products are available to suit nearly any taste. And here are detailed tips to steer you right

1

2

By HARRY WICKS

■ THE HOW-TO INFORMATION given on these pages applies to all prefinished paneling whether it is plywood or hardboard (the latter is shown in the photo above). The only difference is that hardboard usually requires more patient handling because of its density. But it's that very density that gives this paneling a marproof resistance to bumps and bangs; hardboard is a good choice when you anticipate covering a wall that will receive rough treatment.

sizes and thickness

Prefinished panels come in ¼-in. thickness and 4x8-ft. sheets. In some woods, 7, 10 and 12-ft. sheets are available by special order. In recent years, many manufacturers have attempted to hold the price line by shaving the panel thickness—in some cases to a scant ⅛ in. You should know, however, that high-quality paneling in full ¼-in. thickness is still available from top manufacturers. Don't settle for less if you want a first-rate job.

Since each 4x8 panel covers 32 sq. ft. of wall area, you'll find that the work of paneling a room will go surprisingly fast.

3 **PANELING** comes in smooth finishes or textures, in wood tones and colors. Prefinished panels in the rooms on these two pages illustrate the wide variety that is available. On the opposite page are Masonite's Coach House White (top) and U.S. Plywood's Weldwood Gothic Oak. Above on this page is Weldwood Country Place; below are Weldwood Ticonderoga (left) and the finish that Georgia-Pacific has named Portsmouth Hemp.

SEE ALSO

Basement remodeling . . . Family rooms . . . Fasteners . . . Hardboard . . . Moldings . . . Paneling, hardboard . . . Paneling, wood . . . Plasterboard . . . Plywood . . . Remodeling

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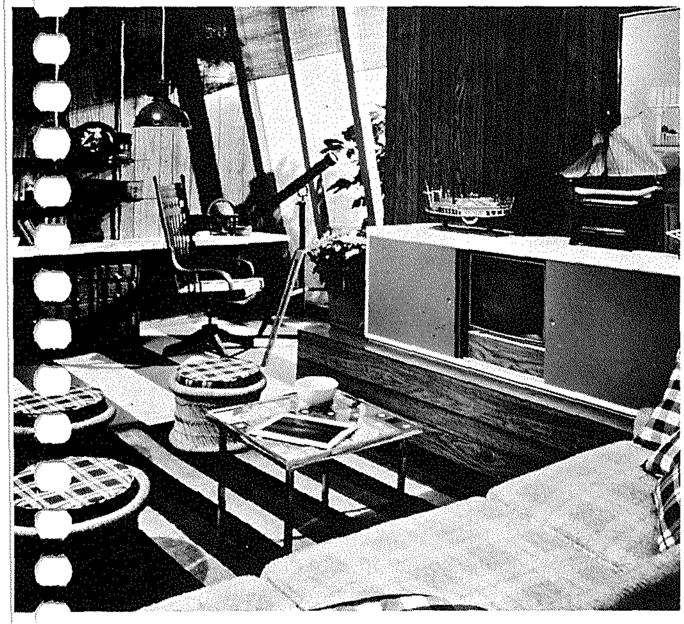
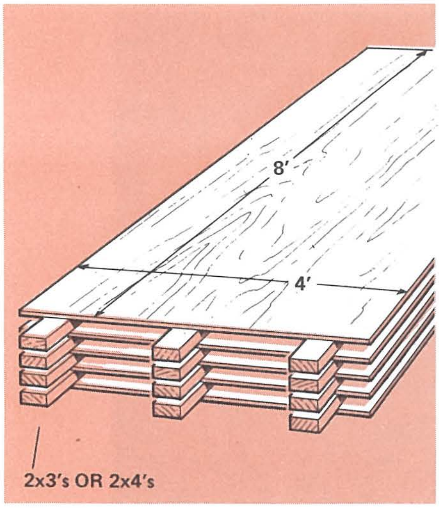
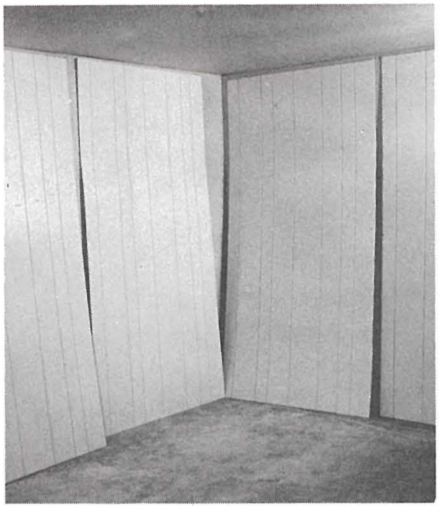


5

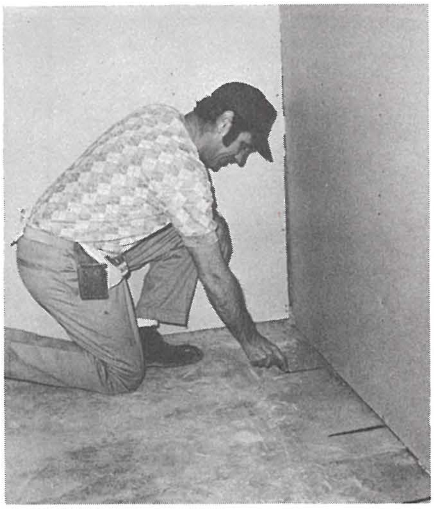
Preparing, fitting and cutting panels



STACK panels for 48 hours before installation to acclimate them to local conditions. Be sure to use spacers.

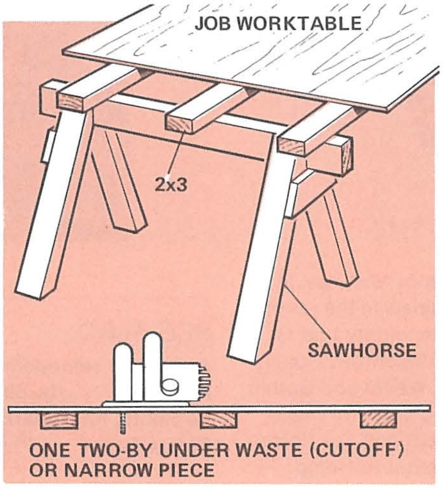


STAND panels around the room for the best grain match in artificial and natural light, then number the panels.

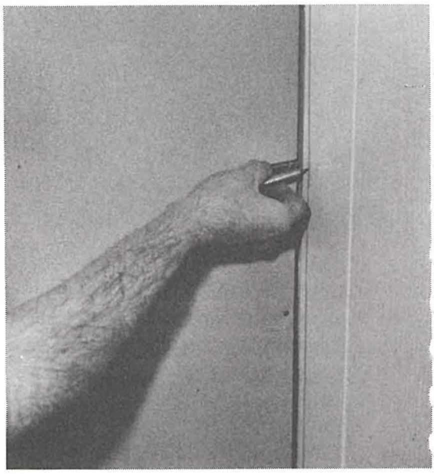


MARK ALL stud locations on floor and ceiling before applying any panels. Use a lumber crayon or chalk.

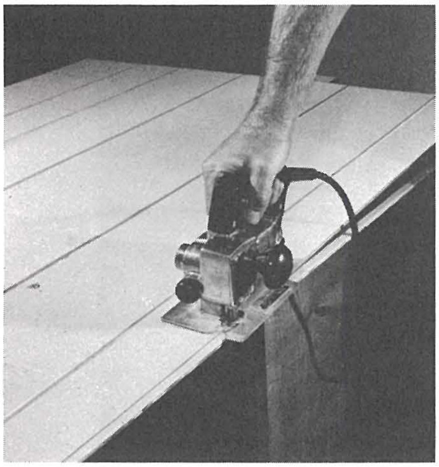
MEASURE from a corner to the center of the farthest stud the panel reaches, then cut the panel an inch wider.



A GOOD setup for panel work with a portable saw is a pair of sawhorses and three lengths of 2x3 or 2x4.

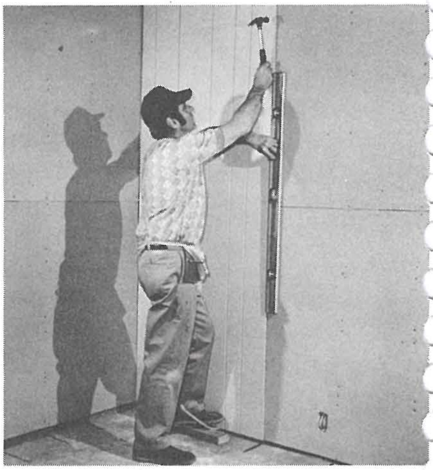


PLUMB the first panel and temporarily tack it. With scriber at 1 in., transfer the corner's outline to the panel.



CUT the scribed edge with a plywood blade in a sabre saw or an 8-pt. crosscut saw having little or no tooth set.

LEAVE the line in cutting the scribed side, then trim carefully up to the line with a block plane or Surform Shaver.



RE-PLUMB the panel, tack it again, check the corner fit, and pencil the wall to show the limit for adhesive.

estimating your needs

Carefully measure the room you plan to remodel and be sure that your figures for windows and door openings are accurate. The easiest way to figure your needs is to add up the lengths of your walls in feet and then to divide this total by 4 (panel width). For example, if the room measures 12x16 ft., add 12 + 12 + 16 + 16 to get 56. Divide this by 4 and you find that 14 panels are needed.

If there are a number of door and window cutouts, you may be able to use those leftover scraps to panel above and below windows and in other less-than-full-height areas. You can estimate this by planning to position a full panel *along the edge* of a large opening. To be safe, bring along a scaled floor plan of the room you want to panel and let your dealer doublecheck your figures.

preparing the walls

If the paneling is to be applied over bare studs, use a straightedge—a long 2x4 without any twist—to determine if any of the 2x4 studs aren't perfectly straight. If you find high spots, whittle them down with a hatchet or plane; low spots can be filled by shimming studs with shingles or folded 15-lb. felt. On new construction, you should staple a vapor barrier (6-mil polyethylene sheet) over exterior wall studs before putting up the panels.

In an existing room, start by removing all casings, moldings and other trim. If the walls are of plaster, it will be necessary to shim out the stud faces where baseboard has been removed. If any plaster is falling, remove it and patch the holes with plasterboard.

Remove plate covers from all electrical boxes and, if possible, free the boxes. These will have to be moved forward at least 1 in. if furring strips are used. They can be reinstalled using clips.

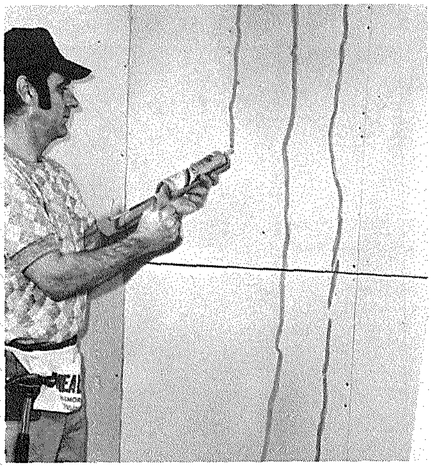
If plaster is in good shape—walls are sound and there is little variance in surface plane—install paneling directly over the plaster. Use plenty of adhesive and don't spare the nails either. Contrary to popular belief, it is a good idea to use a goodly number of nails—in the center of the panels as well as along their edges—even though panel adhesive is also used.

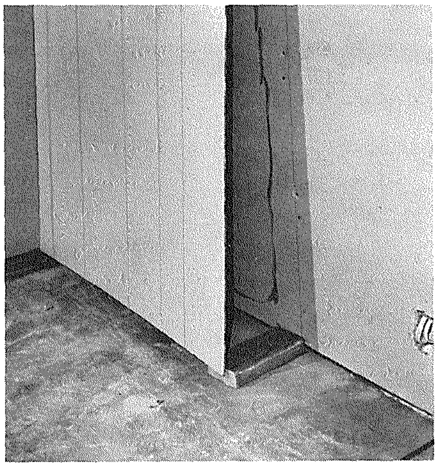
Furring strips are nailed horizontally to the wall and spaced 16 in. on center (o.c.). Use 1x2 furring strips—they're an inexpensive grade of pine—and fasten them by nailing directly into studs. To support vertical edges of the panels, position a vertical strip every 48 in. (or to suit panel width) from floor to ceiling. Apply furring around doors and windows as shown in the sketch at top of page 2216. Where necessary, shim out the furring so that the faces of all strips are in the same plane.

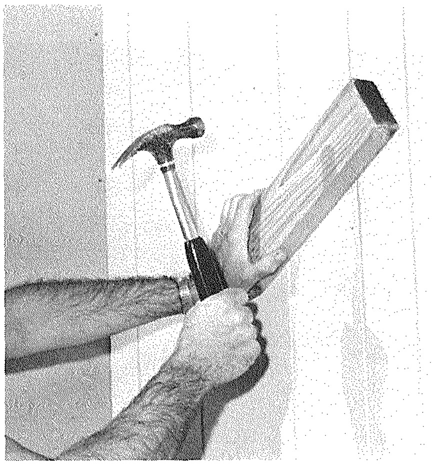
The best way to get a smooth, good-looking wall is with your eye, not a spirit level. Put up all strips without driving the nails home, check the planes of strips using a straightedge and when satisfied, drive home all nails. Low spots can be shimmed (to the straightedge) using undercourse shingles; high spots are reduced either by chopping away plaster from behind a strip or planing down the furring.

putting up panels

Start the job at a corner as shown on page 2214. You'll find most corners are not perfectly true. Thus, you will have to scribe the first panel to the


APPLY adhesive generously. Makers say a cartridge handles five panels, but pros get only two per cartridge.

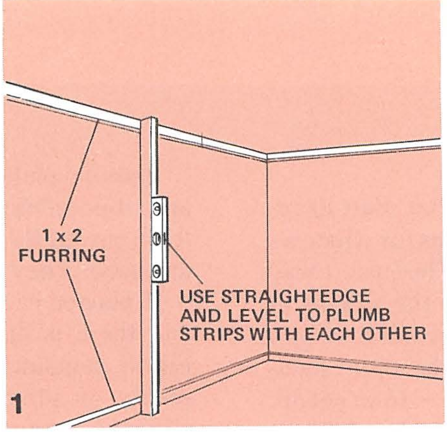

LET THE PANEL touch adhesive, tack it along the top, then back the bottom away to let the solvent flash off.

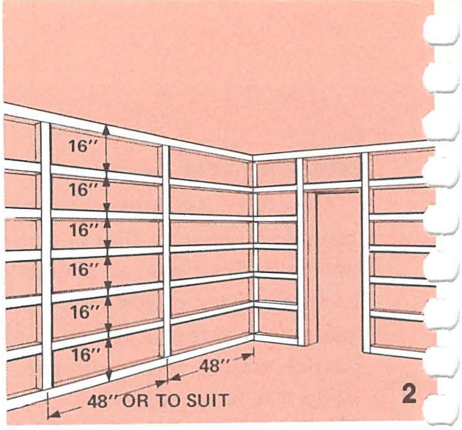

FINALLY, spread the adhesive by sliding a hardwood block over the surface while you rap the block with a hammer.

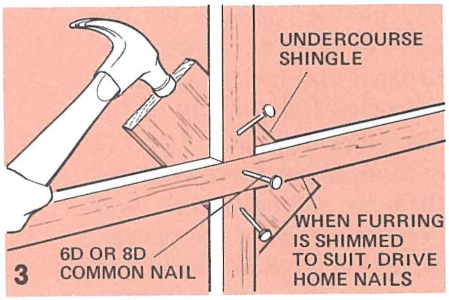
Working with furring strips

APPLY FURRING STRIPS at the top and bottom of the wall (right), then use a straightedge and level to make certain that they are in a plane with each other

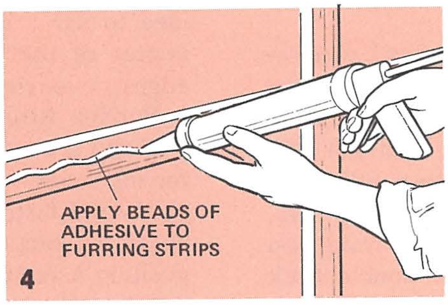
RUN VERTICAL FURRING strips to support the panel edges (far right). The horizontal strips are held in place by 6d common nails driven into the studs.



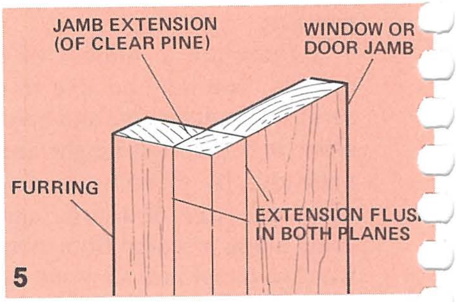




PUT ALL FURRING up without driving home the nails. Then use a straightedge to locate and shim out the low spots.

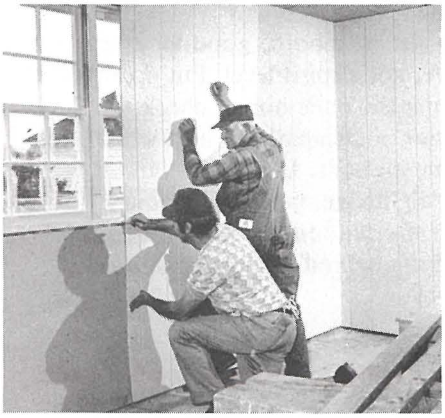


LAY adhesive beads along furring strips. Install panels over the strips with the same technique as on walls.



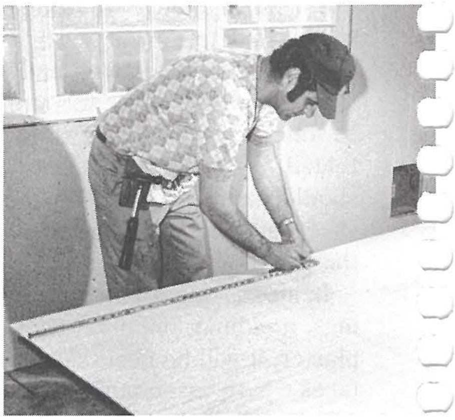
FURRING out existing walls means window and door jambs must be extended. Use clear pine for this work.

Fitting around windows



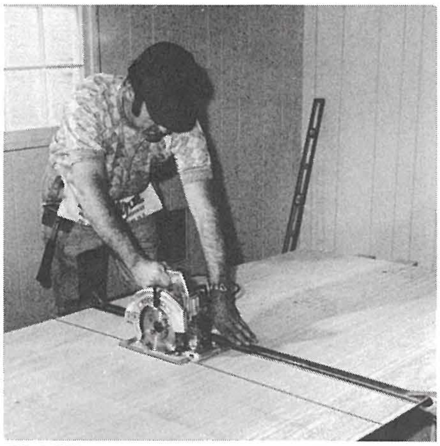
WITH a helper butting a new panel against its predecessor, mark the edges above and below the window.

CHECK for height irregularities under a window by measuring from floor to jamb at each side of a 48-in. panel.

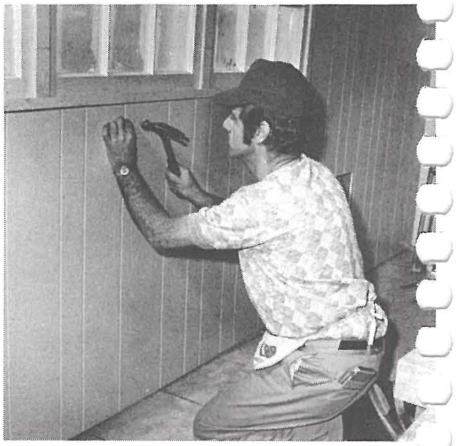


TRANSFER measurements to sheet back Cut pieces to go over and under a window from the same panel for a good match.

CONNECT measurement marks across a panel's full width with a 4-ft. T-square. Then mark the saw shoe's offset.

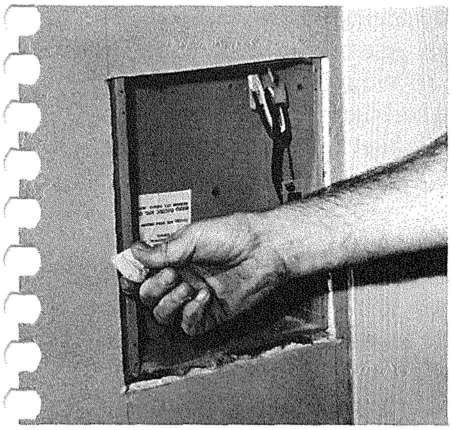


CLAMP a T-square to the paneling so it can guide the saw. The saw's blade should barely clear ¼-in. paneling.

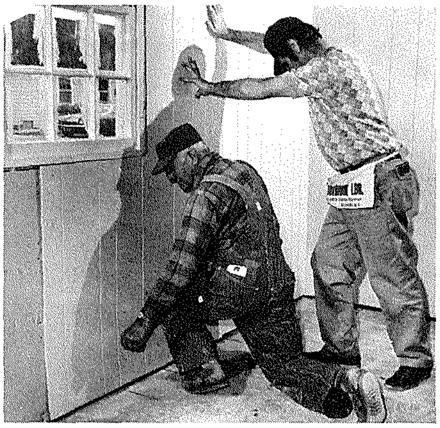


NAILS that are used along the top and bottom edges are located so they'll be hidden by moldings to follow.

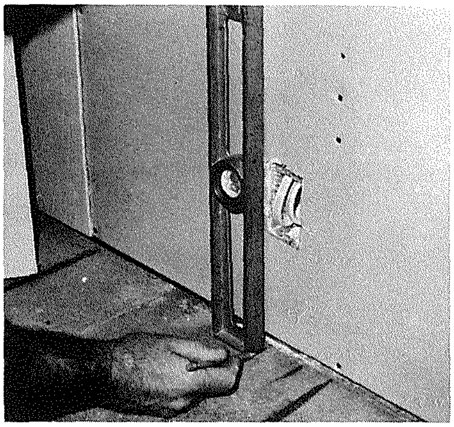
Two ways to make box cutouts



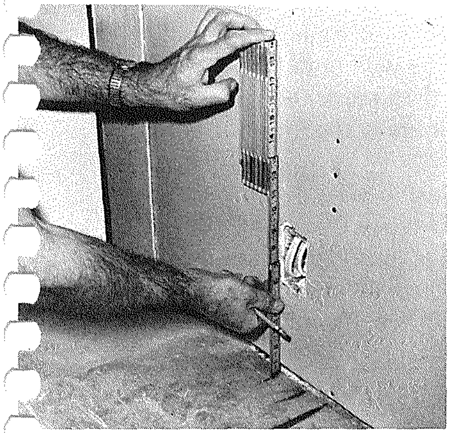
POPULAR but uncertain method is to rub chalk on the face of the box.



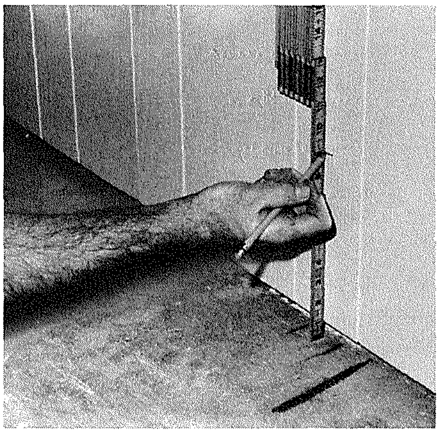
THEN bang the panel's face and hope a clear box outline is transferred.



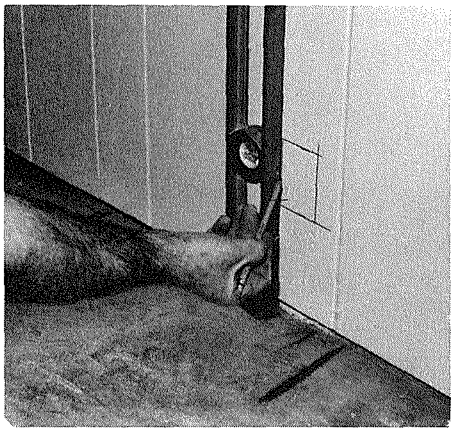
INSTEAD, use a level to locate box edges on the floor just below.



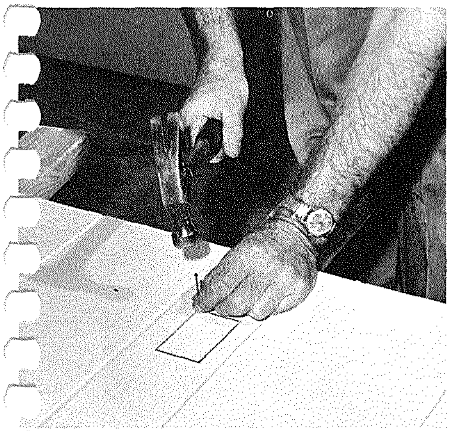
MEASURE and record distances from the oor to box top and bottom.



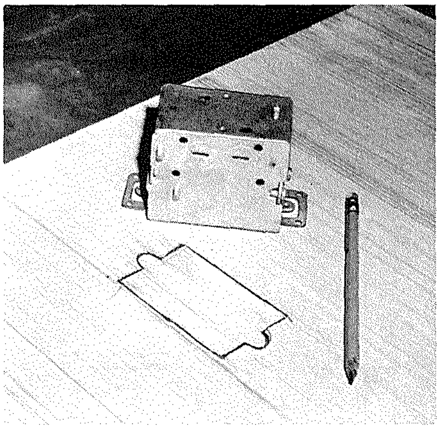
WITH the panel tacked in place, mark vertical dimensions on its face.



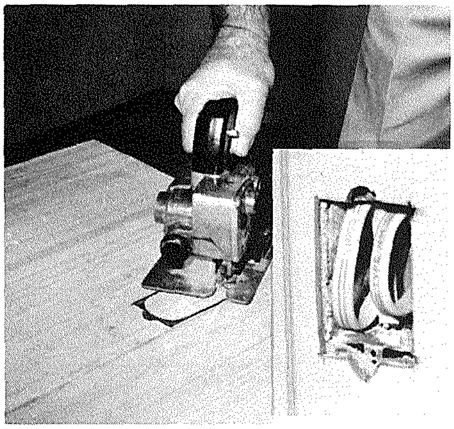
LEVEL guides the edge marks from the floor back to the panel's face.



AY the panel face up and drive a small marking hole at each corner.



FLOP the panel, locate a gem box at the holes, and trace the opening to cut.

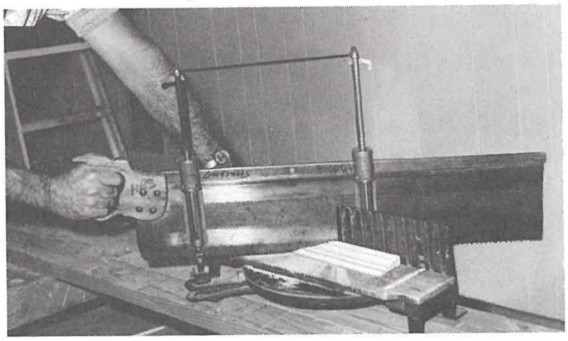


SABRE saw's plunge cut begins the cutout. Or start with a ¾-in. hole.

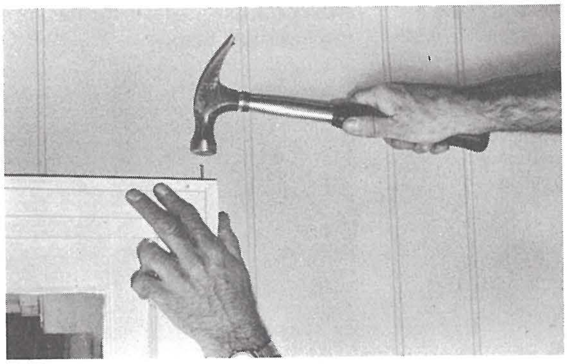
corner. To do it, measure the distance from corner to the *center* of the farthest stud that a full panel will reach. On the job shown, that measurement was 39 in. Next, you add 1 in. of this measurement and cut the first panel to width; in this case, that made it 40 in. Then you hold the panel in place, plumb it with a spirit level and temporarily tack it. Now, with your scriber (a compass works just fine) opened 1 in., transfer the outline of the abutting wall.

Take down the panel and with your sabre saw make the cut, *leaving the line*. Finish by dressing the edge exactly to the line with a sharp block plane or rasp plane.

About moldings



MOLDINGS go on after all paneling is up. For a neat, accurate job, use a miterbox to make all the molding cuts. The precision is built in.



TO COMBAT joints' tendency to gap open, put white glue into molding joints. Then drive 4d finishing nails in from each side for extra insurance.

Butt each succeeding panel tightly against the previously installed panel. (Except when installing hardboard; here you should leave a slight space at the joints. To avoid butting hardboards, tack a couple of thin nails next to the edge of each previously installed panel; pull tacks after the following panel is installed.)

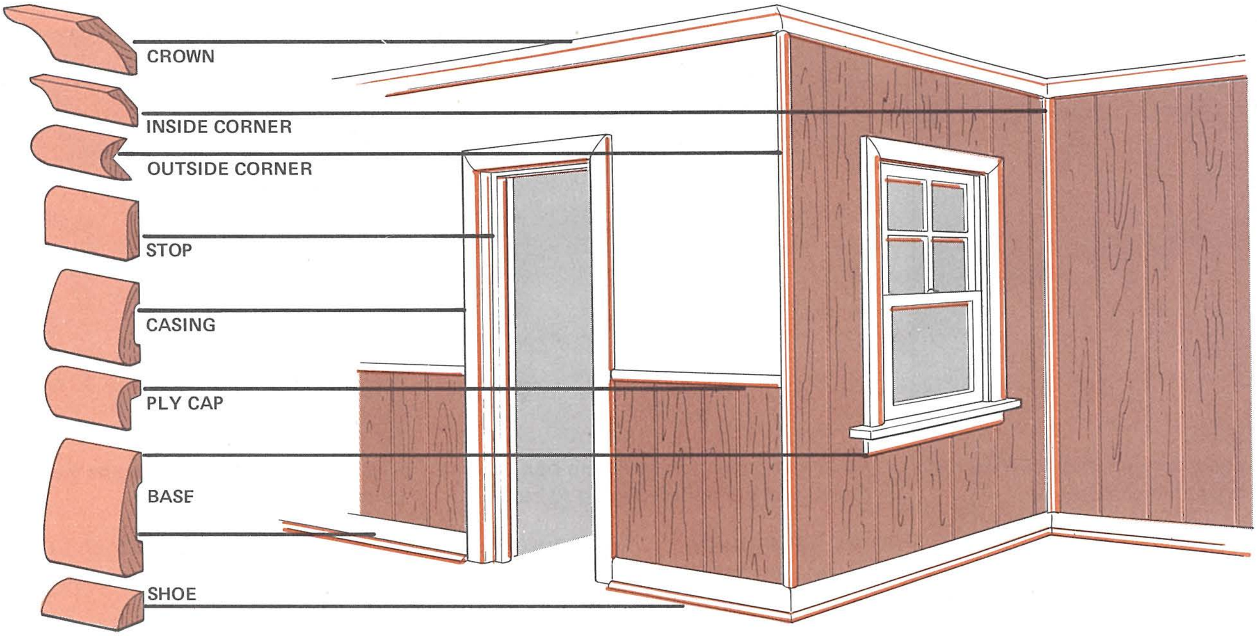
nails and adhesive

When you're nailing to studs, furring strips or sheathing, use either 3d finishing nails or 1-in. brads. Nails should be used every 6 in. along edges and 12 in. on intermediate furring. Generally, it is best to drive nails at a slight angle (toenail) through bevels and grooves. Set nailheads and hide them with a matching putty stick.

Adhesive speeds up the job because it cuts down on the number of nails needed. Don't apply adhesive to the wall until you're satisfied with the panel fit; then mark the panel edge on the wall so you will know the limit for adhesive application.

Squeeze on adhesive liberally and stand the panel in position. Drive in five or six nails *along the top edge*. Then, to permit adhesive solvent to escape (flash off), prop the panel open for six to eight minutes. Remove the block, return the panel to the wall and finish installing it with nails spaced 12 in. along edges, 24 in. in the center.

Pick the right molding for the job



PREFINISHED moldings are offered by paneling makers to match their panel finishes. To keep costs down, you can consider using pine moldings and staining or painting them to match. If you choose this course, install the moldings temporarily for an accurate fit. Remove and mark the installation order of the trim. Then apply the finish to them while they are down. Wait until finish is dry for the final installation.

The easiest and most accurate method of making a cutout is that where a ruler and spirit level is used as shown on page 2217. If you haven't used this stunt before, try a practice run with scrap. The trick here is to make sure that the panel is temporarily tacked in the *exact position* it will occupy when permanently installed so that marks transferred to its face are accurate.

After you mark the panel, place it on your worktable and punch holes with a finishing nail at the cutout's four corners. Flop the panel and connect the holes to mark the cutout on the back side. The easiest way to make the cutout is with a sabre saw. Lacking this tool, you can cut the panel face-side up using a keyhole saw after boring a starter hole with a ¾-in. bit.

There are other methods of marking cutouts—transferring chalk or grease pencil as shown on page 2217, for example. In my opinion, this method is inaccurate because the transferred mark is always too wide for accuracy. Which side of the line do you cut? Or do you cut down the middle? For best results, stick with the first-described method.

carpentry tricks

Worktable. Easy to set up, the worktable shown provides a rigid table for ripping, crosscutting or for making cutouts in paneling. You can make it of a height that's comfortable for you by altering sawhorse-leg lengths; generally, it is best to work over a table no higher than 26 to 28 in. from the floor.

Use at least three 2x3s across the sawhorses. When ripping, make certain a pair of these supports are beneath that portion of the paneling on which the circular saw is riding. The cutoff portion rests on a single 2x3 so it will fall away as the cut is completed and not bind the saw.

Cutting panels. You can use either hand or power saws, depending on your work preference. With either, cutting edges must be razor sharp for you to turn out a craftsmanlike job.

Some use the gimmick of putting masking tape along a line to be cut, believing this to be the only way to avoid splintering a plywood edge. But a sharp tool used properly guarantees the same results.

For hand cutting, use a sharp, crosscut saw with little or no set. Cut with the panel face up, and make certain you support the cutoff piece as each cut nears completion.

With a power saw, use either a plywood-veneer blade or hollow-ground combination blade (no set on either). Cut paneling this way:

- Table saw: Cut with face side up.
- Radial arm saw: Cut with panel face down.
- Portable circular saw: Cut with face down.
- Sabre saw: Cut with face side down. Use a fine-tooth plywood blade, and use the shoe insert if one is provided by the saw's manufacturer.

Moldings. Though it's often tempting to rely on moldings to hide a multitude of sins—in this case that means a sloppy job—every effort should be made to cut and install paneling accurately so you can use the narrowest-possible moldings.

Prefinished moldings, though considerably more expensive than conventional pine moldings, have exacting contours and finishes that perfectly match the panels they are mated to.

Use a miterbox to make all molding cuts—both straight and angled. All inside joints should be coped with a coping saw—to assure a non-opening joint. To do this, first make the 45° cut in the miterbox; next, follow the molding profile with a coping saw. For the tightest fit, hold your coping saw at an angle so that the cut is made with a slight back cut—that is, the front edge should come to a feather edge.

All outside corners should be mitered. To prevent them from opening, apply white glue and install 4d finishing nails through the edges and into the mating molding.

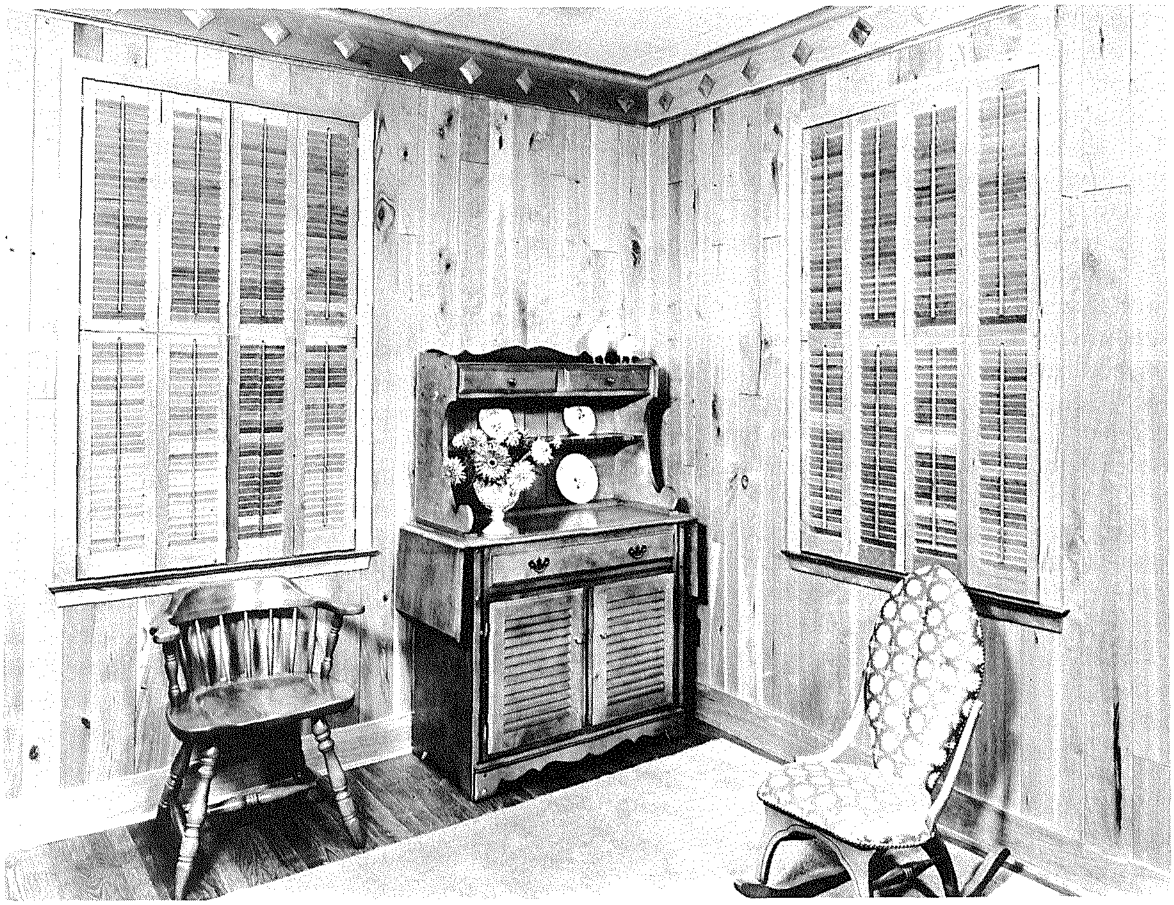
Molding can be applied with appropriate-sized finishing nails or with construction adhesive and (fewer) nails. It's a matter of personal preference.

Moldings are available in a great number of sizes and shapes; you can choose what you need from charts or sample boards that your lumberyard dealer will have on display.

Finishing details. It is not necessary to set and fill every nail on every panel in the room. Professional carpenters locate those that must be set by shining a harsh light along the walls and watching for nailhead reflections from both sitting and standing positions. Nails easily spotted can then be punched in with a nailset and filled by rubbing with a putty stick colored to suit paneling.

To use filler sticks, rub them briskly across the indent to be filled; friction more or less melts the substance into the hole. You can then rub off the excess filler with a clean, soft rag.

If you cannot match your paneling with a single filler stick, mix several sticks until you obtain the perfect match.



Wood paneling—the aristocrat of walls

By RICHARD NUNN

Solid hardwood paneling comes in woods from ash to willow. It complements rooms of contemporary design as well as traditional. And it radiates luxury. Here's the inside story of what's involved in applying this magnificent material

SEE ALSO

Fasteners . . . Hardboard . . . Moldings . . . Paneling, hardboard . . . Paneling, plywood . . . Plasterboard . . . Remodeling

▨ SOLID HARDWOOD PANELING can be called the aristocrat of wall coverings. Much of its charm lies in the fact that it's "solid all the way through," and it will complement rooms of contemporary as well as traditional design.

There are many different solid woods from which to choose. Those readily available include pecky cypress, willow, cherry, maple, pine, ash, cottonwood, red oak and walnut. The panels range in thickness from ½-in. to 1-in. (25/32-in. dressed). Widths vary from 4 in. to 8 in. in 1-in. increments. Lengths are random, although "packaged" solid hardwood paneling such as sold by Townsend, Inc., of Stuttgart, Ark., is put up in cartons that contain an appropriate assortment of random widths and lengths. The pieces are end-matched and packed in random lengths which total 8 ft.

Some panels are tongue-and-groove-matched and they are installed in random widths. Other boards are especially cut in various patterns for use on walls and ceilings. They usually have a V-notch or a bead down the center of the board to add to the decorative effect. You can buy the paneling prefinished with a baked-on acrylic that contains no pigmentation. This makes the surface virtually impervious to damage from children and stains. The material can also be purchased unfinished and rough-sawn.

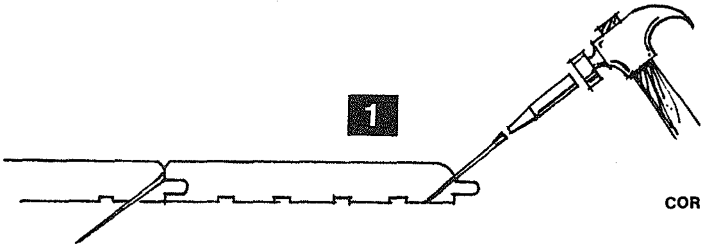
If you plan to use the paneling to build a wall, you will have to frame the wall first (Fig. 4). With new construction, the panels are nailed with 3d or 4d finishing nails on the stripped studs or additional fire blocks spaced between the studs on 18- to 24-in. centers.

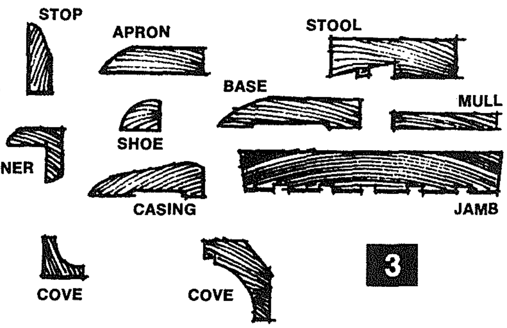
On existing walls, you nail furring strips not more than 24 in. apart (Fig. 5). The panels are then nailed with 3d or 4d finishing nails (Fig. 1) and the nails are countersunk with a nailset. Nailing strips can be applied directly to the studs in new construction, of course. It is not necessary to include nailing strips or blocks behind each end match (horizontal joint); the tongue-and-groove system will provide ample strength (Fig. 6). Fig. 2 shows inside and outside corner details.

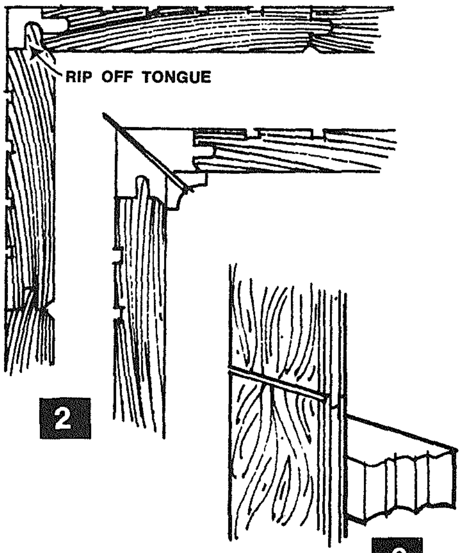
If the paneling you buy is unfinished, don't store it in any spot where it will be exposed to the weather or excessive moisture. New construction should be closed in and dry before application. Be sure all plaster, gypsum wallboard and masonry work is complete and dry before the paneling is installed. The backs of the panels should be sealed before they go up, and the first coat of finish should be applied immediately after installation. Moldings are made to match the paneling (Fig. 3).

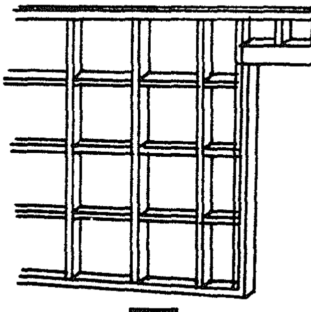
Another tip: If you run the boards horizontally, frame the wall with studs on 16-in. centers. Horizontal applications will make the room appear larger, and the ceiling lower. Vertical applications will make the ceiling appear higher.

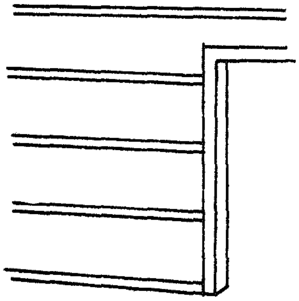
Before you plan to finish a room in solid hardwood paneling, figure not only the price of the paneling but also the framing materials. The cost of framing materials is a substantial part of the cost of the finished wall.

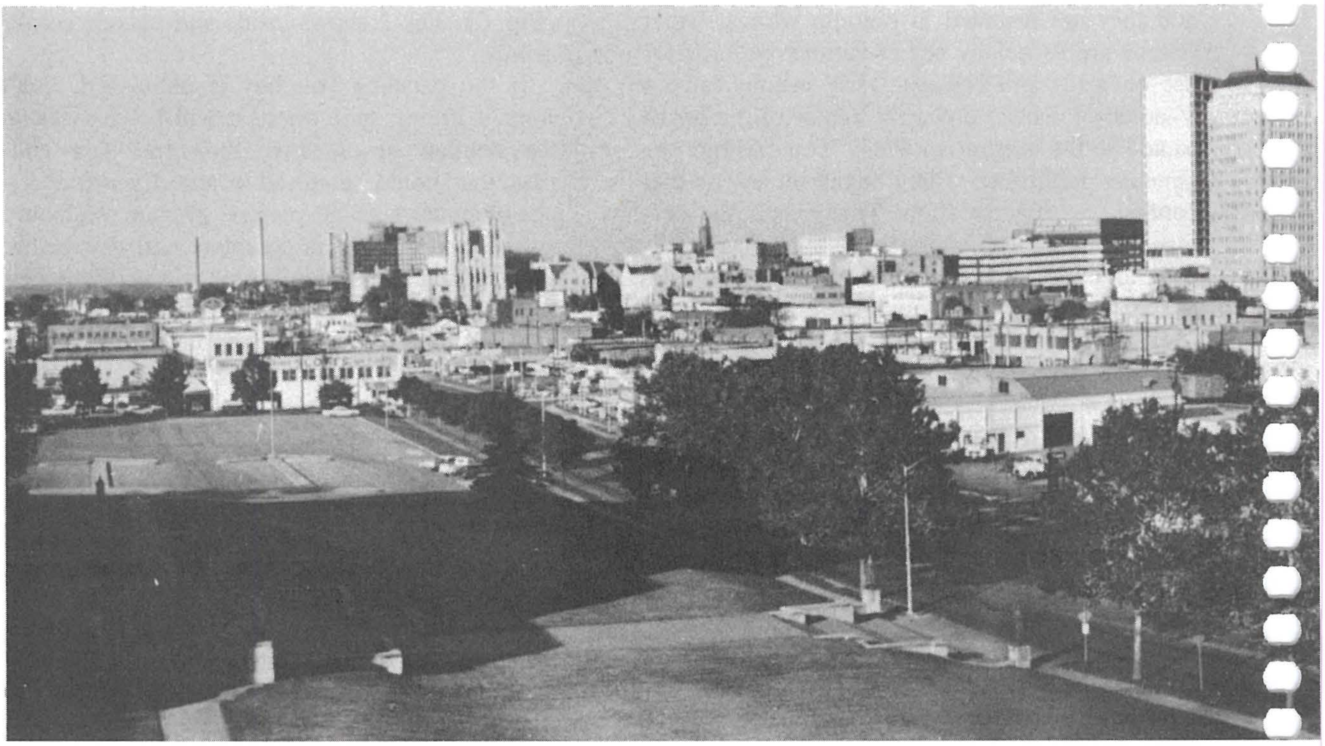








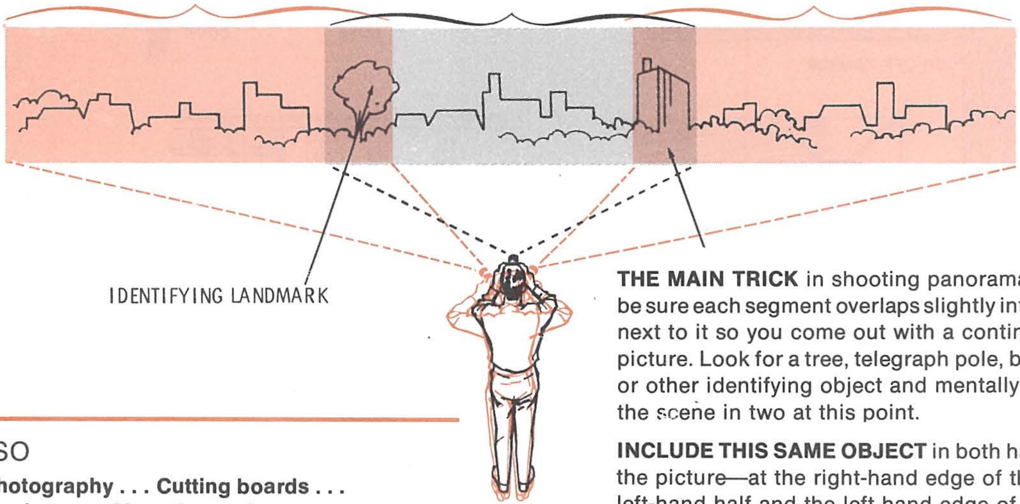




Big panoramas from little pictures

By GORDON SMITH

When you want to capture a beautiful view that's too wide for your camera lens, just shoot it in several parts and piece them together. You don't even need a tripod

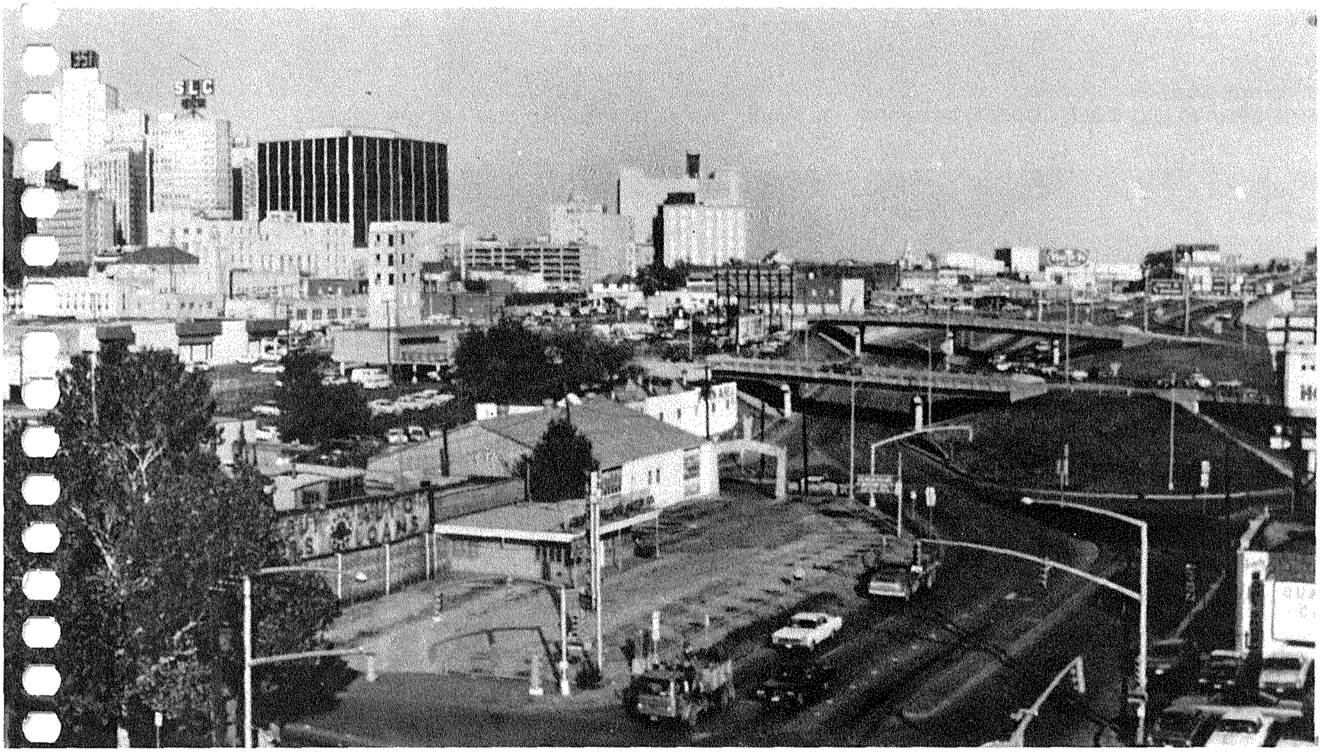


THE MAIN TRICK in shooting panoramas is to be sure each segment overlaps slightly into those next to it so you come out with a continuous picture. Look for a tree, telegraph pole, building or other identifying object and mentally divide the scene in two at this point.

INCLUDE THIS SAME OBJECT in both halves of the picture—at the right-hand edge of the left-hand half and the left-hand edge of the right-hand half. Then you can use the object as a guide to join the two parts of the scene perfectly, as shown on page 2224.

SEE ALSO

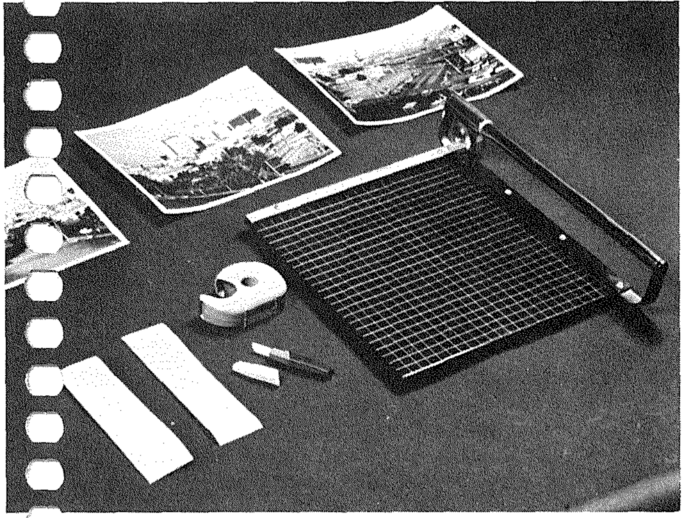
Boating photography . . . Cutting boards . . . Montages, photo . . . Mountings, photo . . . Night photography . . . Outdoor photography . . . Photography



■ HOW WOULD YOU LIKE to make a photograph two or three feet wide capturing the sweeping grandeur of a mountain view, a shimmering seascape or a far-flung city skyline? Such scenes are too big to put on one piece of film. But you can put them on several pieces of film and join the pictures side by side.

Shooting panoramas is often considered a job for a pro, but it's actually a simple process. If you can take one picture, you can take three in a row. The only thing you need to be sure of is that the segments will join together properly to form a continuous picture. Since you can't judge exactly where one scene will end and the next one begin, you deliberately overlap your segments slightly, then trim them later. The drawing on the opposite page shows how you can use a tree, pole, building or other identifying object to help guide you in matching scenes.

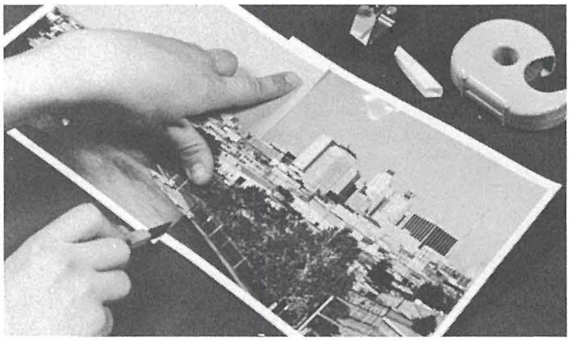
MATERIALS FOR SPLICING are simple—some tape and a razor knife. A paper cutter is handy but not essential. The three prints shown here are those from which the panorama at the top of the page was made.



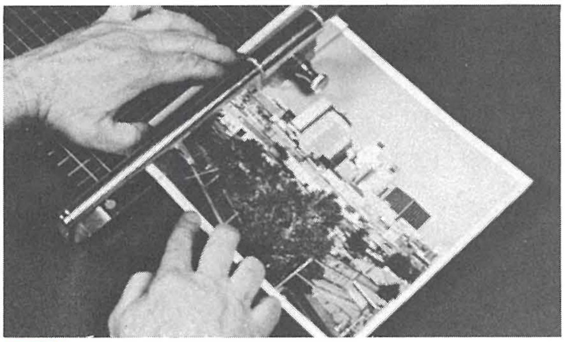
As you swing the camera to take in different views, pivot your body from the waist up without moving your feet. This will keep the camera in the same relative position and minimize distortion. Try to hold the camera at the same level for each view, but don't worry if the alignment isn't perfect. Slight mismatches between views are simply trimmed off later. As a rule of thumb, locate the horizon line about a third of the way down from the top of the viewfinder and this will automatically keep the views aligned. If there is no horizon, use your identifying object to guide your positioning.

Wherever possible, make all shots at the same exposure. Minor differences in negative density can be adjusted in printing to keep the background areas close in tone so the seams won't show.

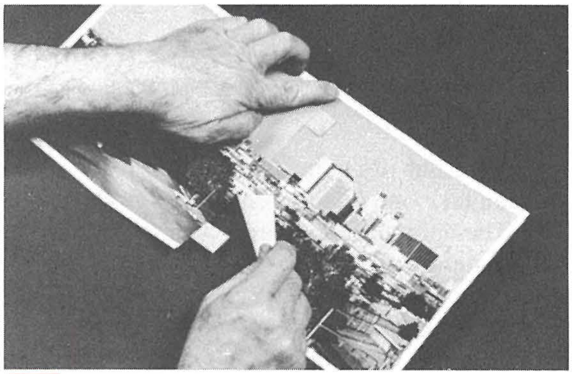
THIS SPRAWLING GOLF COURSE panorama was shot in two parts, requiring only a single splice.



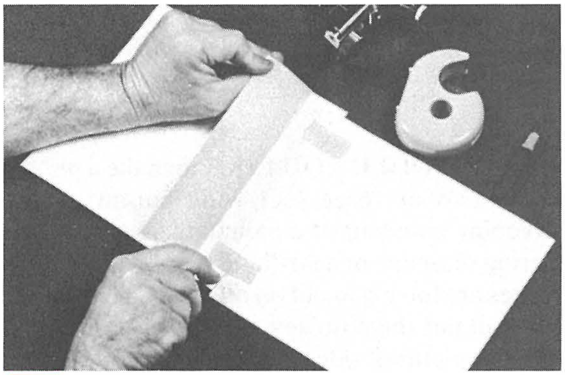
1 **THE FIRST STEP** is to trim the side edge off one print. Make this cut through or near your identifying object. Now slide the trimmed edge over the adjacent print until you have a match. At this point, cut a slit at top and bottom, using the trimmed edge as a guide.



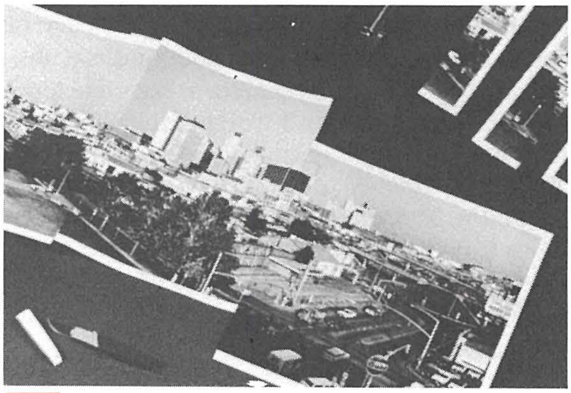
2 **TRIM THE SECOND PRINT** on a paper cutter, using the slit marks on the top and bottom to line it up. This will give you a perfect match with the trimmed edge on the first print. If no paper cutter is available, lay a straightedge over the print and trim off excess.



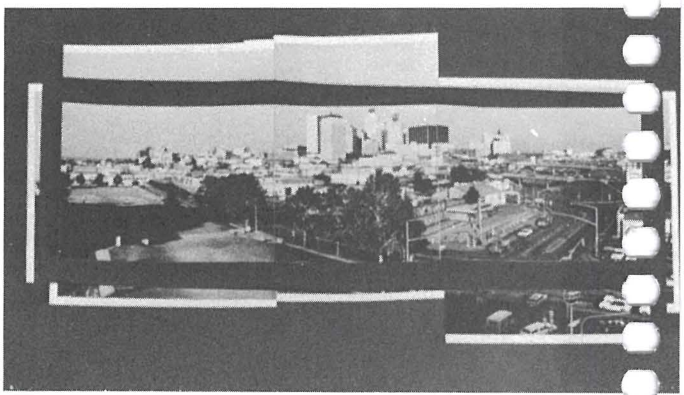
3 **STICK SMALL TABS** of tape to the back of one print so the ends protrude slightly. Let these tabs slide over the adjacent print while you're adjusting the alignment. When the match is perfect, lift the corners of the second print so the tabs slip underneath, then press firmly down.



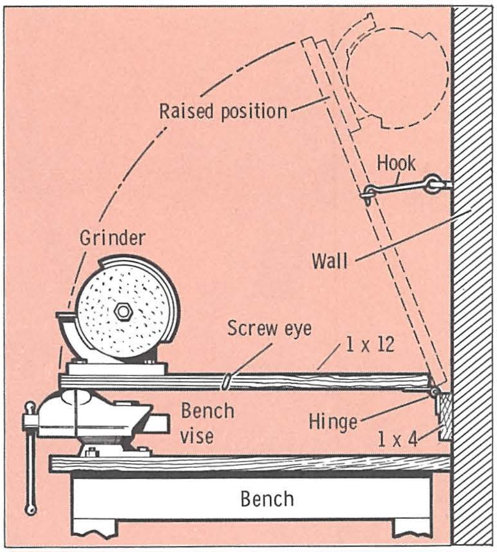
4 **AFTER THE PRINTS** have been temporarily joined with the tabs of tape, reinforce the seam with a strip of wide paper tape. This can be the brown gummed kind used in stores to seal packages, or you can cut a strip of stiff regular paper and fasten it with print-mounting cement.



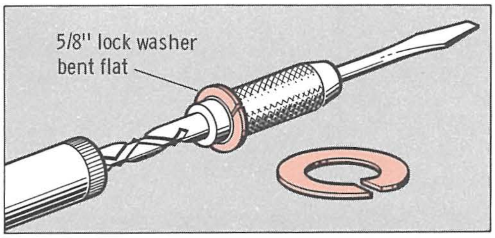
5 **JOINED AT THE SIDES,** the prints are now ready for trimming at the top and bottom. Note that the views do not have to be shot at exactly the same level. The discrepancy shown here was deliberately exaggerated to show that the effect isn't harmful.



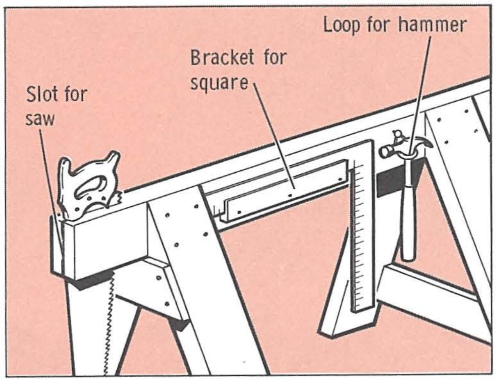
6 **FINAL TRIMMING** eliminates ragged edges at the top and bottom and gives the appearance of a single photograph. Be careful to keep the horizon level. Lay a straightedge across the top of the picture and measure up from the horizon line at each end so trim will be parallel.



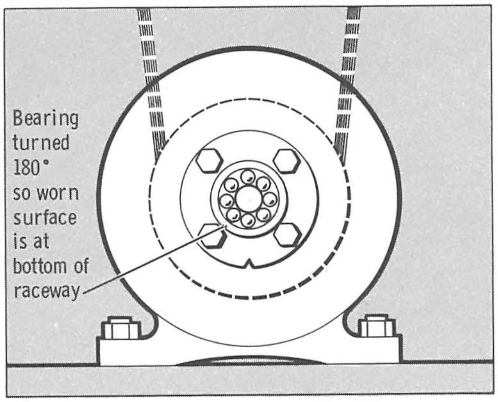
IF A MACHINIST'S VISE is already taking up valuable workbench space, you can hardly afford to have a grinder permanently bolted to it also. Since a grinder is used far less frequently than a vise, here's a way you can mount it to swing up out of the way when not in use. Bolt it to a 1x12 board and hinge it to a 1x4 block screwed to the wall. Mount the block to a height to bring the grinder level with the top of the vise. A 3 or 4-in. vise will hold the grinder at a nice working height. A couple of sturdy hooks and eyes will stow the grinder against the wall.



SOONER OR LATER you're going to pinch your fingers when using a spiral ratchet screwdriver. You can avoid this by placing a collar over the chuck as shown. A split lock washer, annealed, flattened, spread apart and forced over the knurled grip, will do the trick nicely. To anneal the washer, heat it to a dull red, then let it cool slowly.

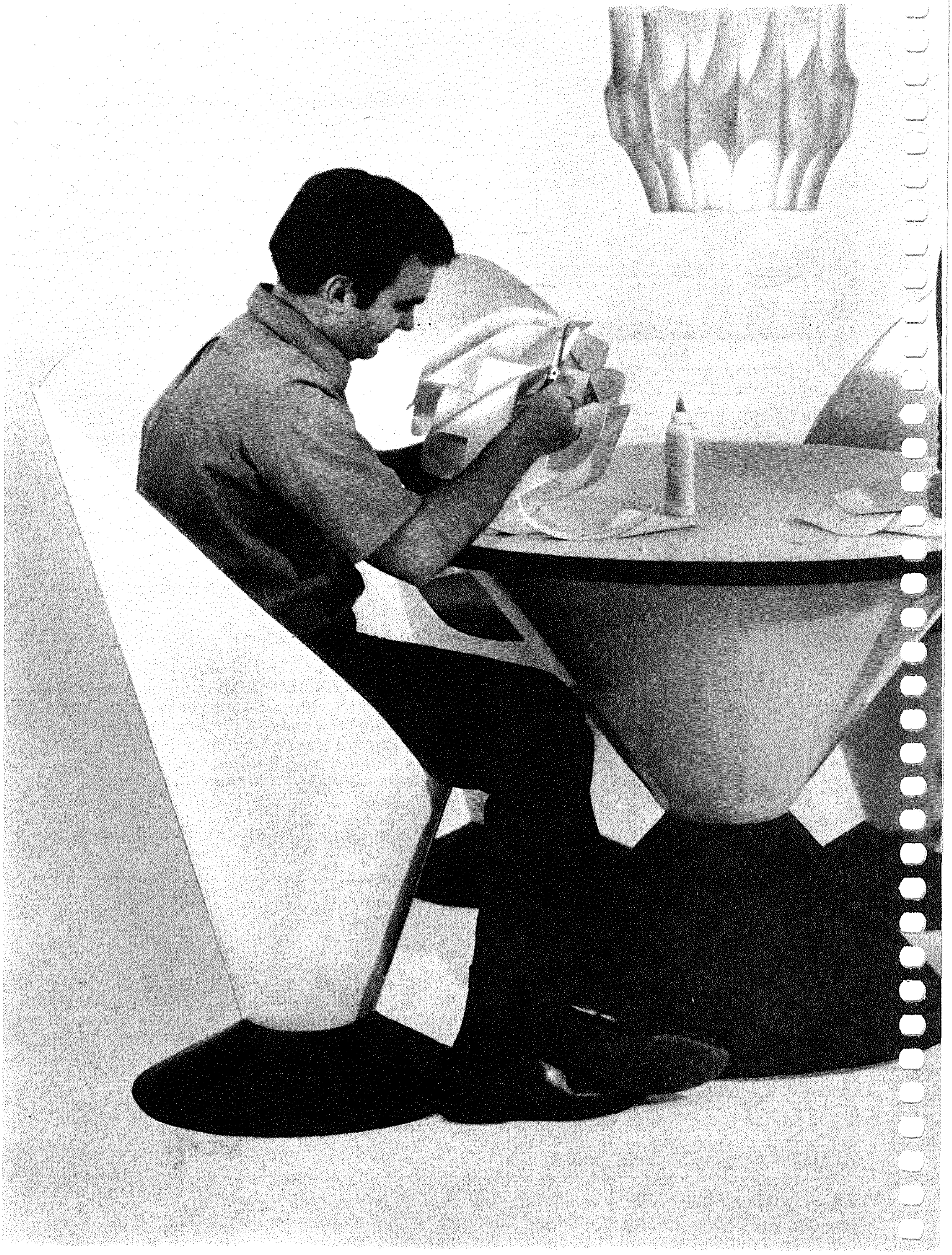


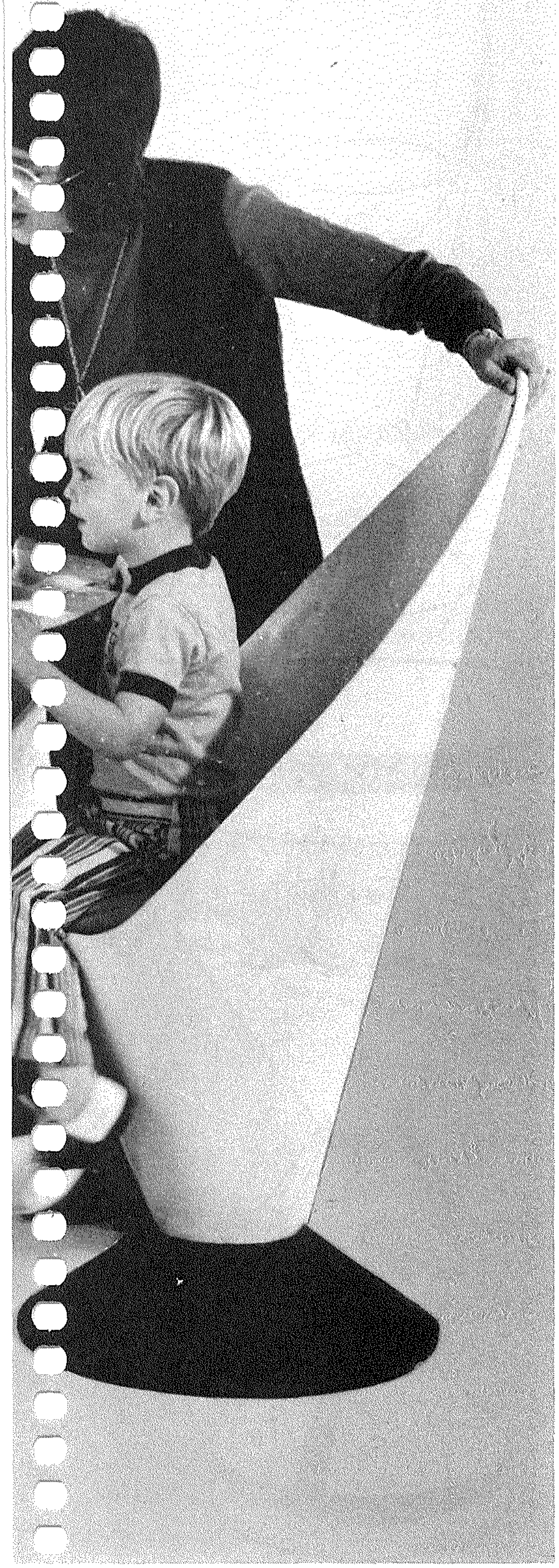
THERE ARE THREE THINGS you can do to make a wooden sawhorse handier when it comes to keeping track of your tools. Cut a slot in one end for the saw, tack a piece of flooring (groove side up) to hold a framing square and attach a loop for your hammer. You'll know right where these tools are when you're looking for them.



THE BEARING next to the pulley on your lathe motor may start to run noisily at some point. Constant belt tension causes the outer raceway of the bearing to wear. Simply rotate the bearing housing 180°. This brings a new surface to the top to resist belt pull and stops the noise.

WHEN CUTTING corrugated aluminum roofing, you may find that the regular skip-tooth blade of an electric saw will cut across the "hills and valleys" much faster if the blade is put on backward. It also will make a smoother cut.





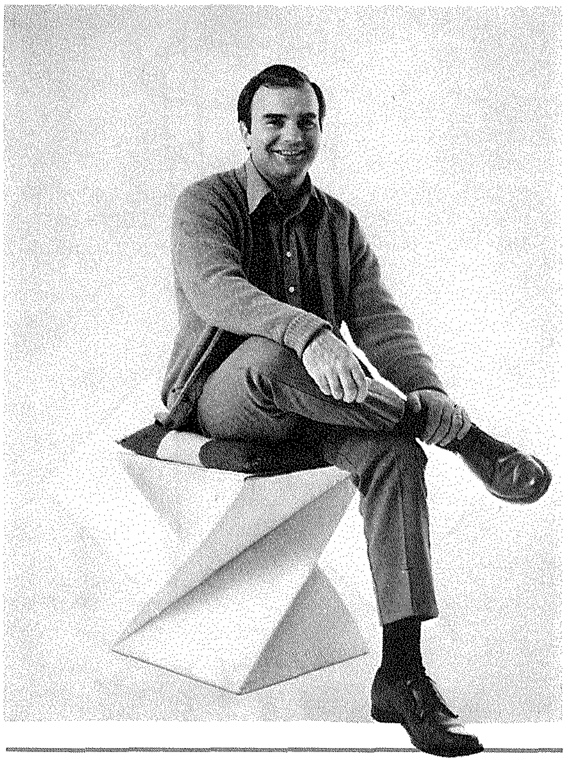
Build some paper furniture

By HARRY WICKS

HERE'S A PROJECT the entire family can have fun working at. The paper furniture is easy to assemble and costs little. You might even be fortunate enough to get the material free in the way of a carton from a local appliance dealer or warehouse. But even if you have to buy the cardboard, the total cash outlay for the set is in the super-economy class.

Designer Ted McLaren of Saint Paul, MN, built the prototype table-and-chair set for use in his dining area. The stool-like chair (below, with Ted comfortably seated) is unbelievably strong because of its design. These can be turned out

THE CIRCULAR TABLETOP is constructed of two layers of cardboard, then painted with enamel. Designer Ted McLaren estimates that typical cost for the dining set would be under $10. The stool-like chair below can be made for a couple of dollars.



SEE ALSO

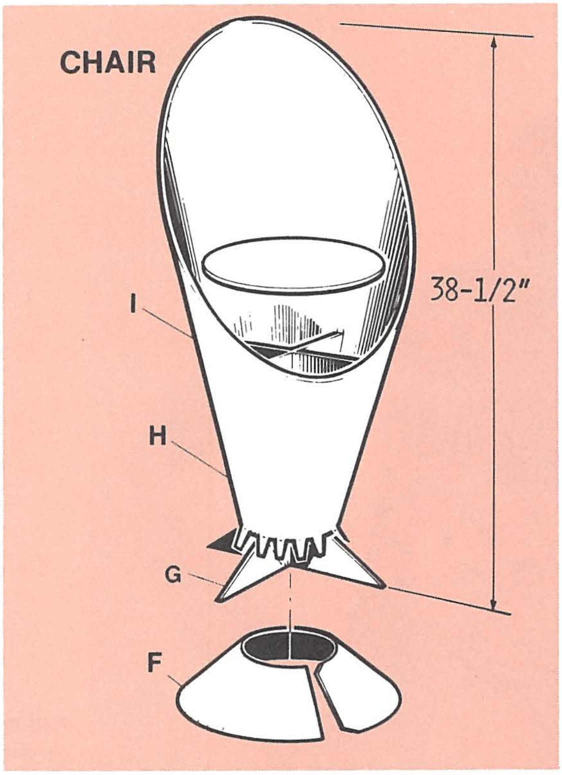
Cabinet furniture . . . Chairs . . . Children's furniture . . . Dining tables . . . Family rooms . . . Modular furniture . . . Occasional tables . . . Party tables . . . Stools

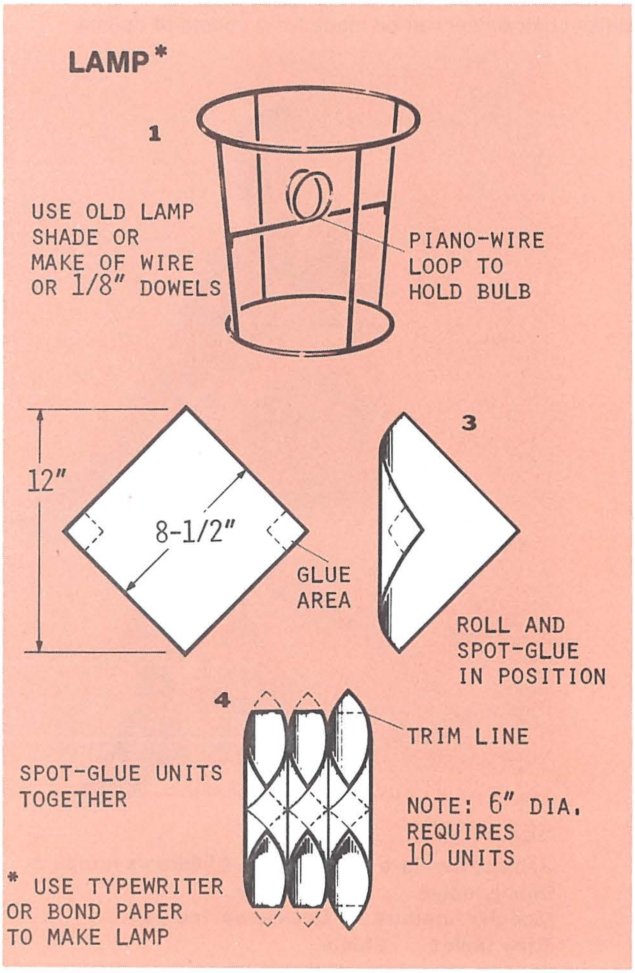
production-style to provide extra seating galore in a family room or on the patio.

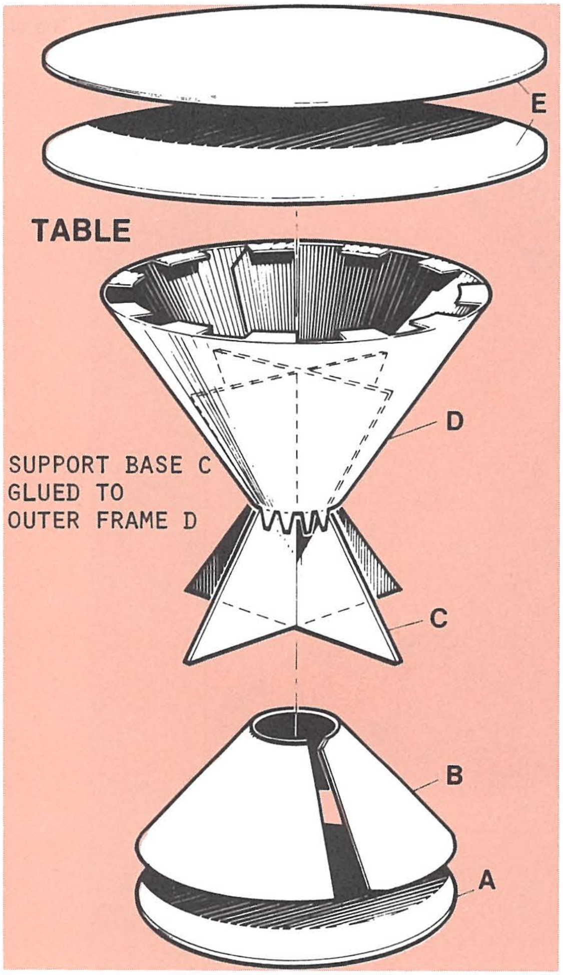
To locate the nearest source for corrugated cardboard, look in your local classified directories under *Boxes-Corrugated and Fibre*. The cardboard that was used in our shop to build a sample table and chair (to check strength) was labeled 225 Test, B Flute. It's very strong. But if you can obtain V-3 C board, we found that it is even stronger and is waterproof. To prevent warping, the tabletop is made up of two pieces of cardboard glued together with their corrugations at a 90° angle. The laminated top comes close to matching plywood's strength.

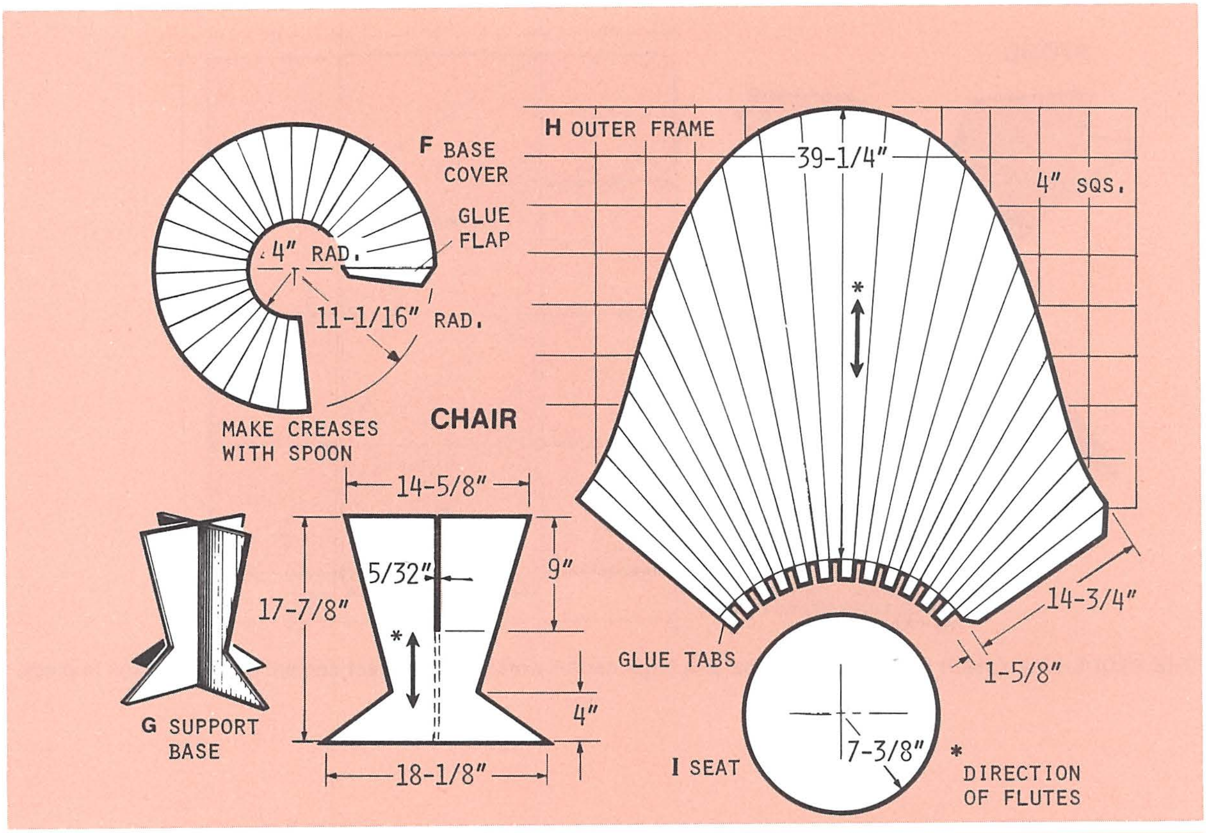
Construction consists of four basic steps: laying out, cutting, creasing and assembly.

To lay out: On certain pieces such as the base supports, it is important that the "corrugation grain" run in the correct direction. Obviously, if the grain on these were horizontal instead of vertical, strength would be greatly reduced.




LAMP*
1
USE OLD LAMP SHADE OR MAKE OF WIRE OR 1/8" DOWELS
PIANO-WIRE LOOP TO HOLD BULB
12"
8-1/2"
GLUE AREA
3
ROLL AND SPOT-GLUE IN POSITION
4
SPOT-GLUE UNITS TOGETHER
TRIM LINE
NOTE: 6" DIA. REQUIRES 10 UNITS
* USE TYPEWRITER OR BOND PAPER TO MAKE LAMP




F BASE COVER
GLUE FLAP
4" RAD.
11-1/16" RAD.
MAKE CREASES WITH SPOON
CHAIR
H OUTER FRAME
39-1/4"
4" SQS.
*
14-3/4"
GLUE TABS
1-5/8"
14-5/8"
5/32"
9"
17-7/8"
*
4"
18-1/8"
G SUPPORT BASE
I SEAT
7-3/8"
* DIRECTION OF FLUTES

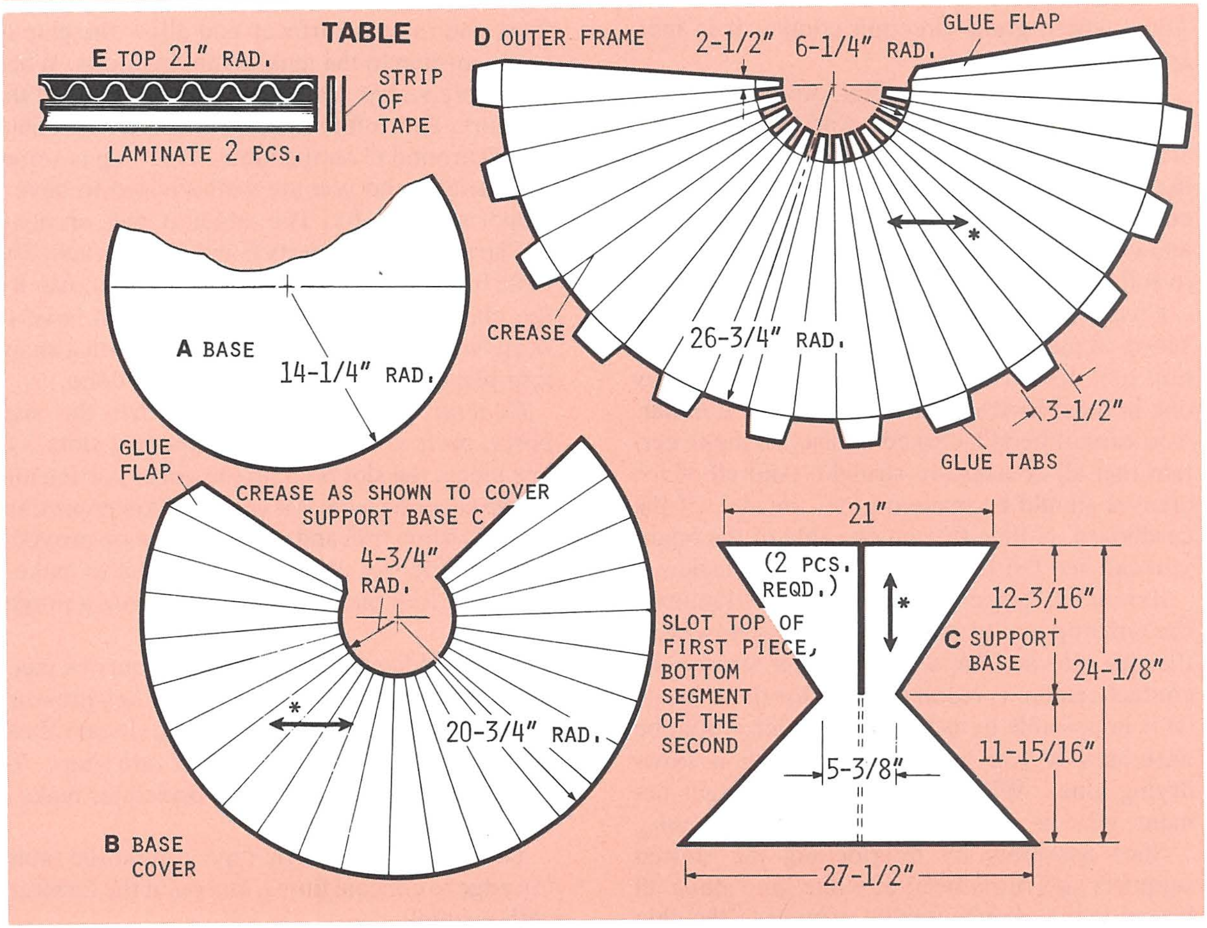
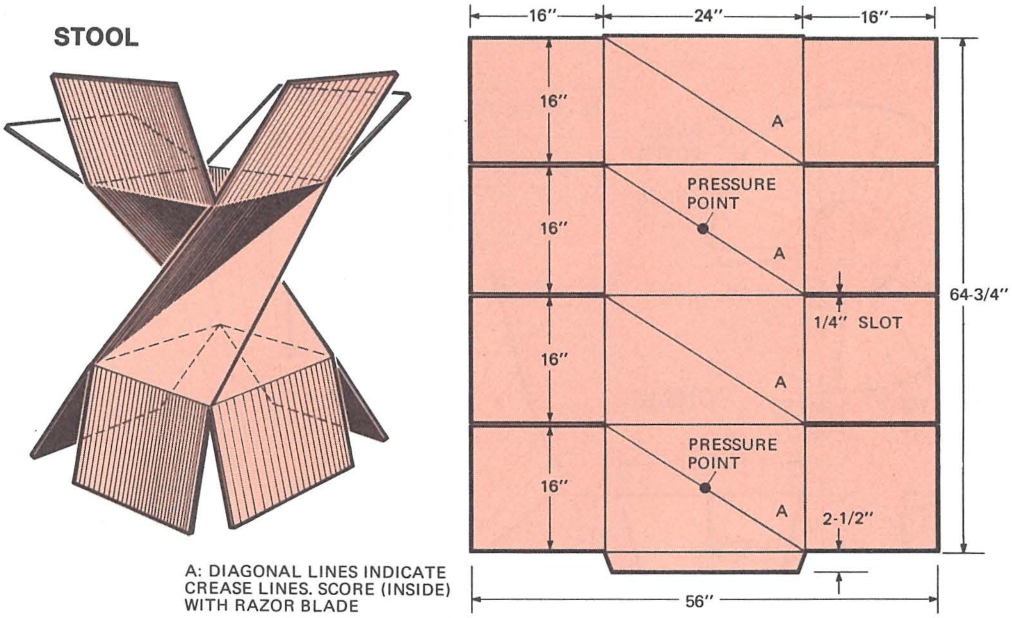


TABLE
E TOP 21" RAD.
STRIP OF TAPE
LAMINATE 2 PCS.
D OUTER FRAME
2-1/2"
6-1/4" RAD.
GLUE FLAP
*
CREASE
26-3/4" RAD.
3-1/2"
GLUE TABS
A BASE
14-1/4" RAD.
GLUE FLAP
CREASE AS SHOWN TO COVER SUPPORT BASE C
4-3/4" RAD.
*
20-3/4" RAD.
B BASE COVER
21"
(2 PCS. REQD.)
*
12-3/16"
C SUPPORT BASE
24-1/8"
SLOT TOP OF FIRST PIECE, BOTTOM SEGMENT OF THE SECOND
11-15/16"
5-3/8"
27-1/2"



A: DIAGONAL LINES INDICATE CREASE LINES. SCORE (INSIDE) WITH RAZOR BLADE

THE STOOL-LIKE CHAIR is cut from cardboard. A large carton works fine. Contact cement glues the flaps in place.

Thus, where grain direction counts, it is indicated on the drawings.

Cutting the board: A utility knife used with a straightedge works best. And to keep the straightedge from slipping, apply a strip of masking tape to its underside. *Caution:* When you are cutting close to the flutes, move the knife slowly and carefully because the blade has a tendency to follow the fluting.

Creasing: You can use the back of a hefty spoon to make the crease, but a screen installation tool does a better job faster. You can buy one in most hardware stores for about a dollar. You cannot bend a curved crease, so make certain that all creases are straight. And all of the creases should be made on the "inside" of the cardboard. Notice that on one side of the board you can see the lines. This side is the inside.

Assembly: You can use white glue to laminate the tabletop and to make butt joints. However, the glue tabs and flaps will be under tension, so contact cement is recommended for these parts. (It is impossible to use clamps, which would be necessary if you were working with a slow-drying glue). When working with contact cement, bear in mind that it is highly flammable.

Start assembly by interlocking the slotted supports and run a bead of white glue along all butted joints. Apply contact cement to the glue flaps and mating surfaces and allow the glue to set according to the maker's instructions. When the adhesive has set, wrap the frame around the support. This refers to H around G on the chair, and D around C on the table. This step is somewhat tricky and you are well advised to have a helper standing by. The tabletop goes on next.

The base covers, parts B and F, go on last. The table base-cover goes on easily, but the cover for the chair is rather stubborn. You will have to keep twisting and bending the piece until it snaps into place. Don't despair, it can be done.

General information. Notice that the supports, parts C and G, have opposing slots. On one piece, the slot is cut in the upper portion and on the second piece, it is cut in the lower portion. Though some trial and error in our shop proved a $^{5}/_{32}$-in.-wide slot acceptable, it's best to make a couple of trial pieces in order to assure a proper fit.

The stool-like chair. This is cut from one piece of cardboard. The trick lies in those key pressure points. After cutting and creasing, locate these points and simply twist the chair into shape. To familiarize yourself with the principle, make a scale model first.

To finish, apply fabric tape around the tabletop edge to conceal flutes, and paint the furniture with enamel.

Removing pencil marks

My Junior marked several boards of hardwood I'd recently bought for a do-it-yourself project. I tried sanding lightly but this only spreads the marks. I think a soft-lead pencil was used but I'm not sure whether it was a lead pencil, china pencil or black crayon. What to do?—L.O., Wash.

If the marks were made by a lead or china pencil or even a crayon, then sanding won't do. If you think they are lead-pencil marks, try an ordinary eraser first. If that doesn't work, rub marks lightly with a cloth dipped in alcohol (substitute fine steel wool for cloth if the wood is open-grained such as oak). Wipe up any excess alcohol immediately. If you suspect that the marks were made by crayon or china pencil, try using turpentine.

Kitchen-cabinet door bumpers

I have steel cabinets in my kitchen and the rubber door bumpers have deteriorated. Several are missing. Are replacements available, or is there a substitute?—E.R., Kans.

The cabinet manufacturer can probably supply new bumpers, but you can make them yourself. From a small piece of ⅛-in. sheet cork cut pieces about ½ or ¾-in. square. Remove the old bumpers and cement these replacements in their places.

Gold rush

I always have trouble applying gold paint to wood. Even though I spray the stuff from a pressurized can, it never looks quite right–can't get a smooth surface and the grain shows right through several coatings. Just what does one do to get a smooth, uniform finish?—M.O., Fla.

Gold paint, one of the so-called metallic paints, is quite sensitive to the surface over which it is applied. It will "reproduce" the surface in just about every small detail. I've always had fair success applying ordinary gold paints over an enamel coating. If the wood is open grained, apply a filler and sand the surface smooth. Then apply at least two coats of enamel, allowing ample drying time between each. Smooth the surface of the enamel with fine steel wool. This gives a surface that's smooth yet with sufficient "tooth" to hold the gold paint. Finally, although gold paint can be applied with a fine, soft brush, spraying gives a more uniform coating and a more realistic appearance of gold leaf, which most gold paints are intended to simulate.

Some newer types of gold paints contain special vehicles which are, in effect, self-leveling. They give very good results when applied as directed. However, in the end it's the surface you prepare that really determines the quality of the finish you get. A common rule, but one especially true when applied to metallic paints.

Tile over wide flooring

I've purchased an old home. The rooms upstairs are floored with wide boards that are rather rough. Some are cupped, with cracks and openings between boards. I'm thinking of laying tile in all the upstairs rooms and the hallway. My problem is to prepare these old floors. Can you help with suggestions?—E.L., Md.

First of all, it will be necessary to level the old flooring. Usually this can be done by nailing along the edges of the boards, but if not, the flooring will have to be sanded in order to provide a flat surface for overlayment. Any depressions at wear points should be overfilled with wood putty and sanded. Also any chance knotholes, splits or other defects should be filled in with a wood putty or otherwise repaired. In any event the old floor should be strengthened by new nailing. (Baseboards should be removed, of course.)

You have a choice of ¼-in. plywood or hardboard of the same thickness for underlayment. In most cases, tempered hardboard is the better choice for laying over an old floor, although plywood is acceptable. In any case, the underlayment must be nailed solidly; otherwise, squeaks may develop in time. Try to plan and cut the pieces of the underlayment so that you do not end up with a narrow strip at the walls or in a doorway. Also be sure the underlayment is nailed down uniformly with no offsets at the joints.

Haunted house?

I live in a fairly new ranch home and when the wind blows hard from the northwest, I sometimes hear an alarming buzzing or whistling sound, loud enough to awaken me from a sound sleep. I've traced it to the front door but nothing I've done, even shifting the striker, has stopped it. All windows and doors are weatherstripped so they should be tight. Can you tell what's wrong?—D.W., Iowa.

It's probably the weatherstripping, likely at some point just above or below the lock. Drive a few extra nails at both of these points and you'll no doubt sleep more soundly.

by W. Clyde Lammey

Nesting party tables

Whether they are for a child's birthday party or just for chairside use, these handy tables will always be handy around the house. They can be mass-produced and are covered with bright decorative laminate

By WAYNE C. LECKEY

WHEN IT COMES to storing, these individual serving tables are no problem. They all nest neatly within a lamp table to become part of it.

You'll find them handy whenever a small chairside table is needed to hold a drink, ashtray or TV sandwich. They're perfect, of course, for a children's party.

The best way to wind up with four identical nesting tables is to mass-produce them. For example, the four top shelves can be bandsawed at one time, likewise the four center shelves and the four bottom shelves. Stock for the eight backs can be ripped 11 13/16 in. wide, then crosscut into 19½-in. lengths. Stock for the fluted aprons is grooved, kerfed on the back and then ripped crosswise into four strips 2 in. wide.

Run the miters on the eight backs before you cut back the front edges. To cut the latter, run your table-saw blade as high as it will go and set the fence for a ¾-in. cut. Then rip four of the backs for a distance of 8 in. Do the same with the other four after resetting the fence to the left side of the blade. This will produce four right and four left-hand members. Finish the cuts by sawing in from the edge on a ¾-in. radius, then round off the top corner.

cover with laminate

The tops and front edges of all 12 shelves are covered with decorative laminate in whatever color you prefer. We used J-M's Melamite (gypsy red) to contrast with white painted tables. The edges are banded first, then the surfaces, except the four top shelves. Wait until these shelves are nailed in place.

You can save a lot of masking if you paint the inside surfaces of the backs before installing the shelves. Glue and nail the mitered edges, keeping the assemblies square, sink and putty the nailheads and spray with two coats of white semigloss lacquer.

Any void found in the plywood at the front edges should be puttied beforehand, of course, and sanded smooth. The center and bottom shelves are nailed in place from the back, while the top shelves are nailed down from the top.

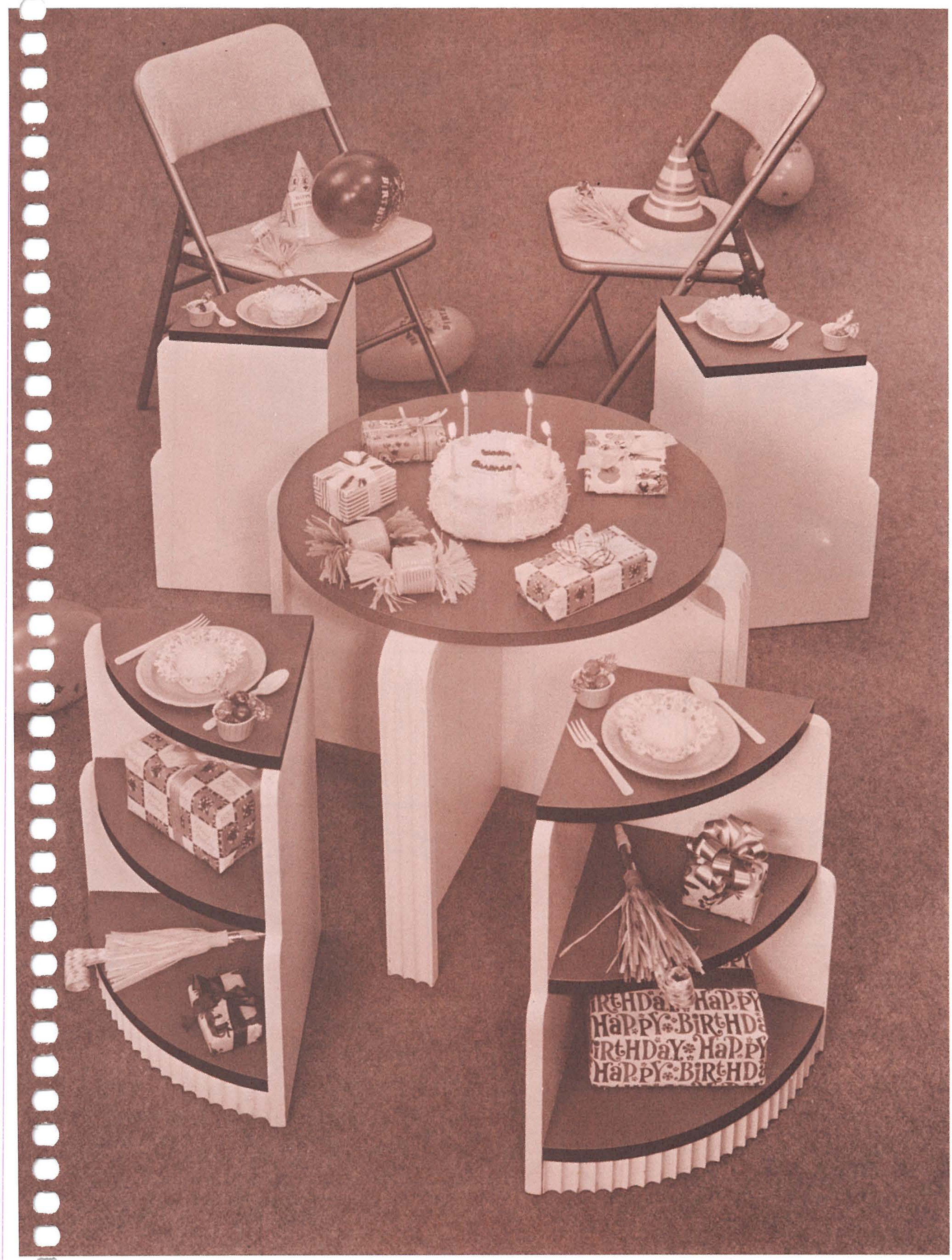
making the flutes

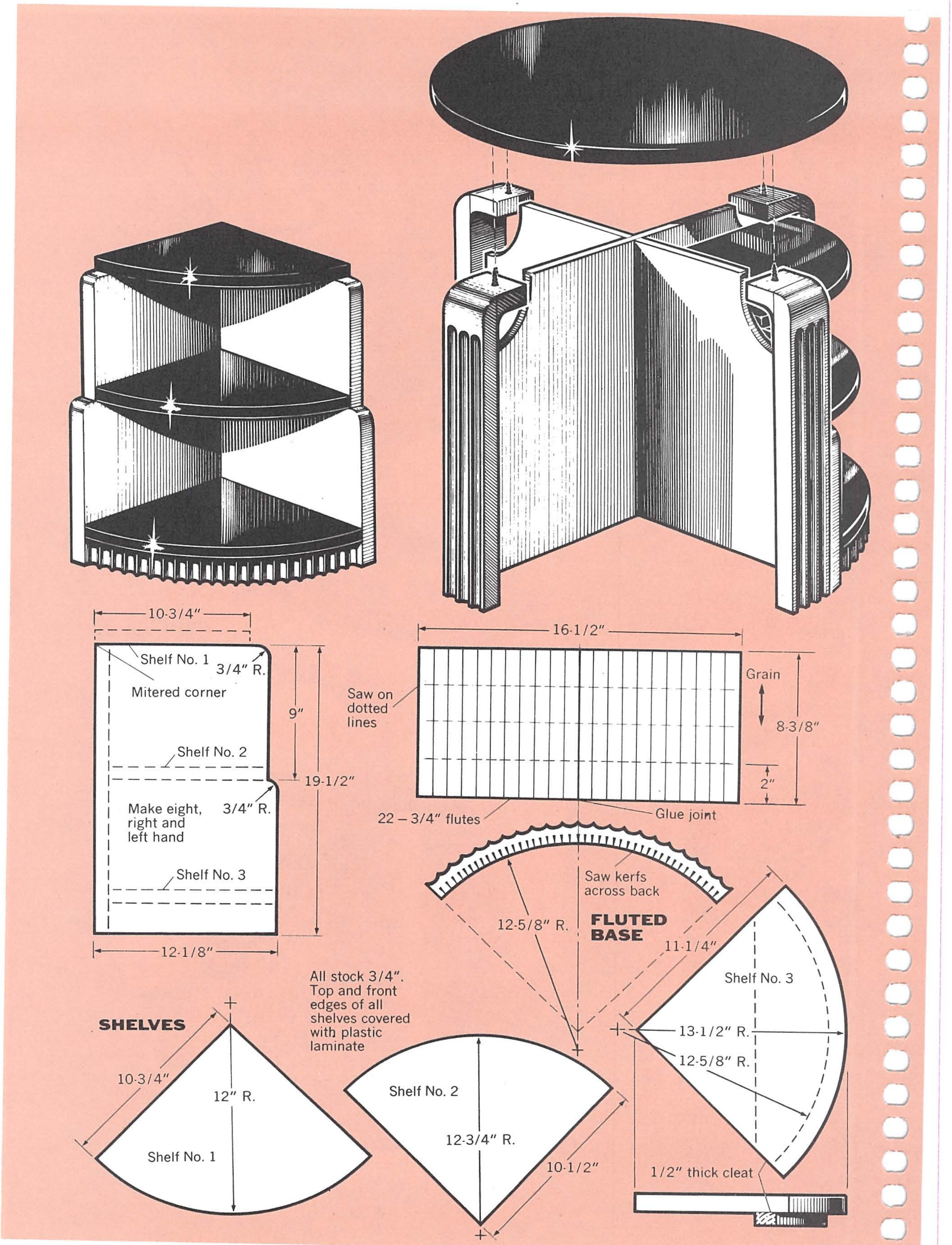
This leaves the fluted aprons. Two pieces of ¾-in. pine, 8¼ in. wide, are edge-glued to make a board 16½ in. wide. Notice that the grain must run vertically. Twenty-two flutes are made across the board, either with a ¾-in. core-box router bit or a molding head on your table saw. If you make them on your saw, use a ¾-in. scrap for a spacer. Set the fence to make the first cove and make the cut. Then with the work brought back against the fence and held intact, back the fence away and drop in the ¾-in. scrap. This is done each time as you work across the board. The last cove cut should arrive at the very edge of the board.

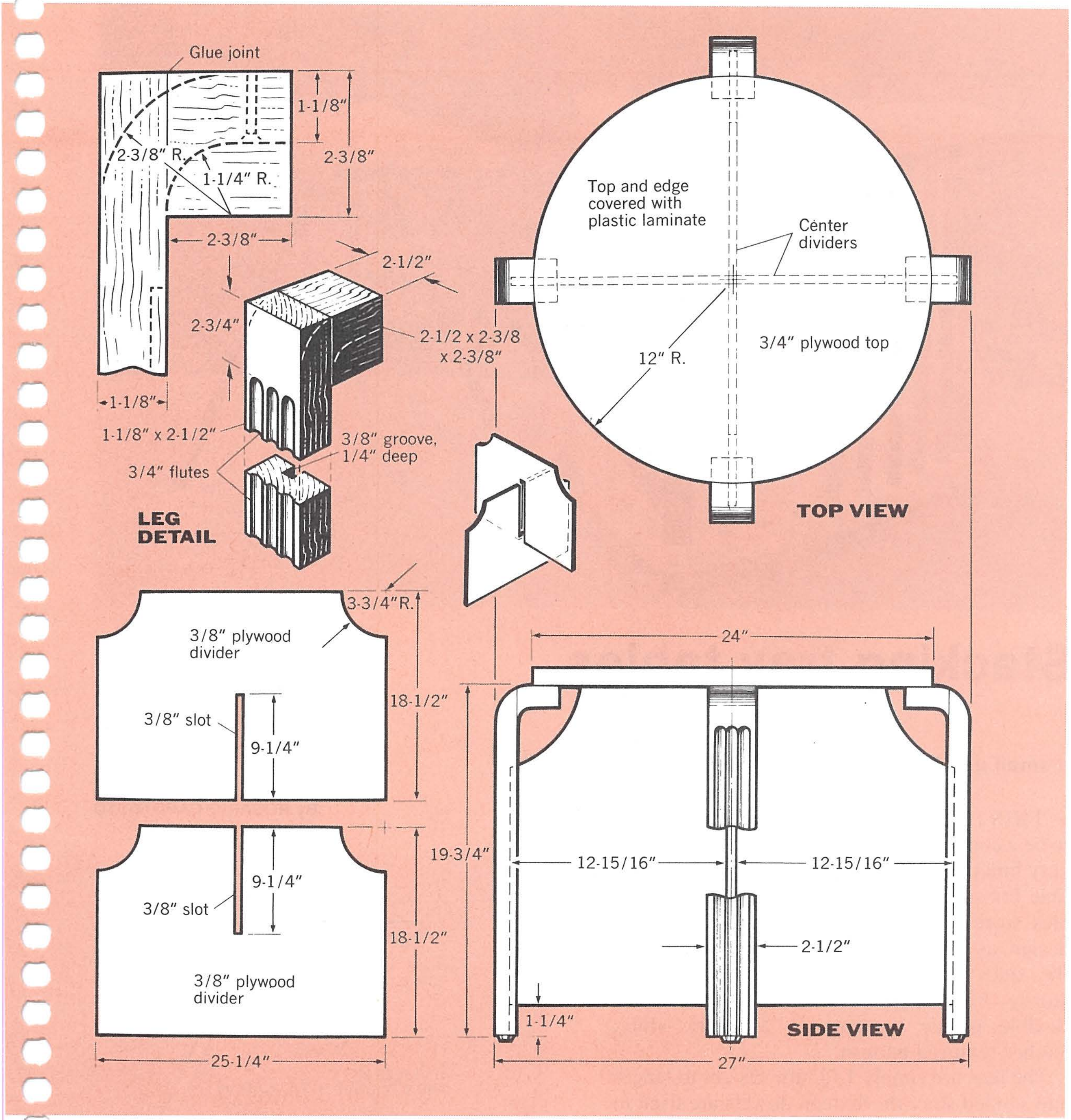
Now a series of ½-in.-deep, closely-spaced saw cuts (kerfs) is made on the back of the board, with the grain, and completely across its width, after which the board is ripped crosswise into 2-in.-wide strips. The kerfing permits bending the strips so they can be glued to the curved cleats which are screwed to the underside of the bottom shelves. Notice that the cleats are set in

SEE ALSO

Coffee tables . . . Family rooms . . . Game tables . . . Occasional tables


HAPPY BIRTHDAY HAPPY BIRTHDAY


10-3/4"
Shelf No. 1
3/4" R.
Mitered corner
9"
Shelf No. 2
19-1/2"
Make eight, right and left hand
3/4" R.
Shelf No. 3
12-1/8"
16-1/2"
Saw on dotted lines
Grain
8-3/8"
2"
22 – 3/4" flutes
Glue joint
Saw kerfs across back
12-5/8" R.
FLUTED BASE
11-1/4"
Shelf No. 3
All stock 3/4". Top and front edges of all shelves covered with plastic laminate
SHELVES
13-1/2" R.
12-5/8" R.
10-3/4"
12" R.
Shelf No. 1
Shelf No. 2
12-3/4" R.
10-1/2"
1/2" thick cleat

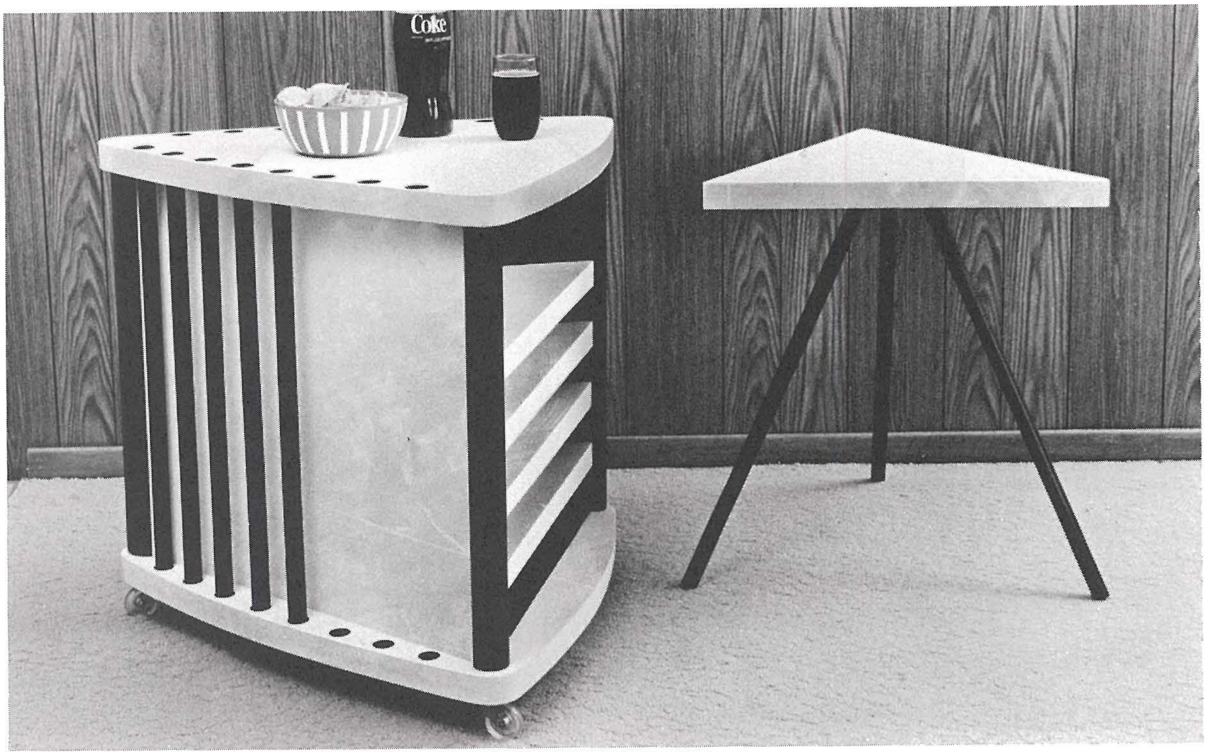


⅞ in. from the front edge. You can now complete painting to suit your tastes.

To build the circular parent table, start with the legs. These are cut to size from 1⅛-in.-thick pine and grooved down the center on the inside for a distance of 16 in. to accommodate the two plywood dividers. Blocks are then glued to the upper ends of the legs, scribed with a compass, bandsawed and sanded. Three ¾-in. flutes are run in the face of all four legs and stopped 2¾ in. from the top. Then holes are drilled for flatheaded screws for attaching the legs to the circular top.

The dividers are made alike except one is slotted down from the top. Add a little glue to the slots and slide them together, then add glue to the grooves in the legs and insert the dividers. They should be flush with the tops of the legs.

This leaves the circular top which is cut from ¾-in. plywood and covered with matching decorative laminate. Complete the painting before attaching the top, and finally hammer metal furniture glides into the ends of the legs. Your tables are ready for use.



Stacking tray tables

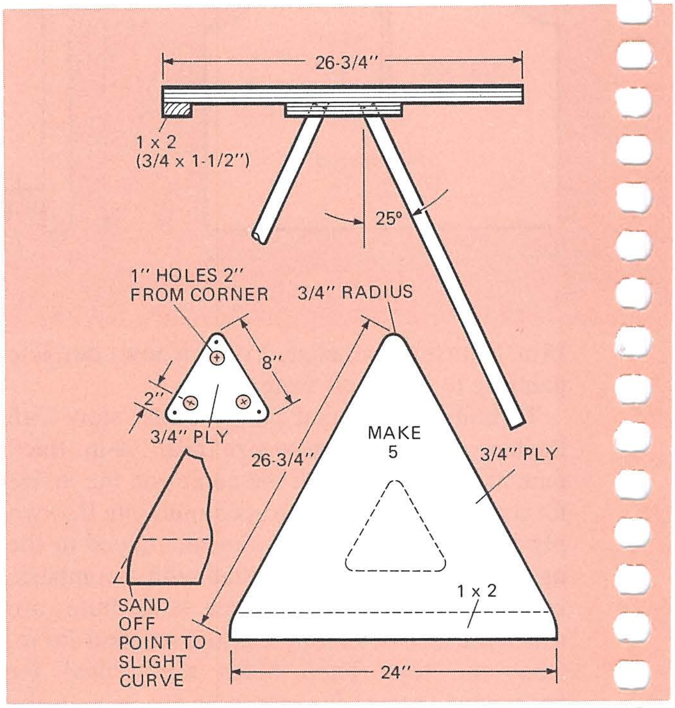
This one small unit holds five attractive and functional tables

By ROSARIO CAPOTOSTO

■ THIS HANDSOME serving table will prove to be a conversation piece at a party as well as a very functional piece of furniture when it comes time for snacks. Five good-sized triangular tables store conveniently to add to the striking design, as do the legs, which are contained along the sides of the table. The construction is sturdy—¾-in. plywood surfaced with Conolite flexible plastic laminate in a smart white, leather-textured pattern.

The legs are simply 1-in. dowels cut to length and sanded smooth. Sixteen dowels are used in the interest of symmetry; only 15 are required for the 5 tables. The tables are set up by simply inserting three legs borrowed from the main table.

Make the brackets for the legs by drilling three 1-in.-dia. holes at a 65° angle in triangles of plywood and glue them to the underside of the



SEE ALSO

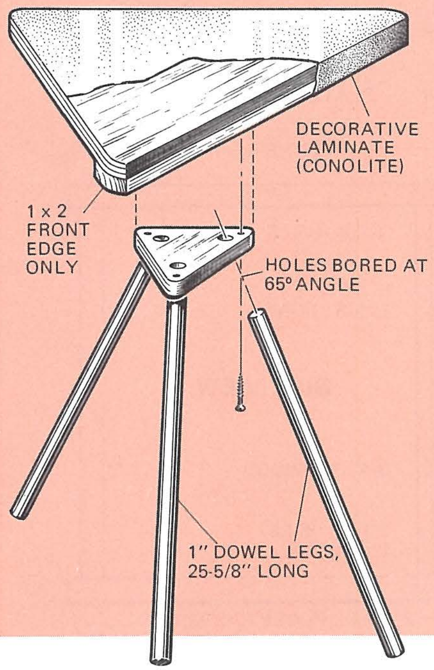
Butler's tables . . . Dowels . . . Game tables . . . Laminates, plastic . . . Occasional tables

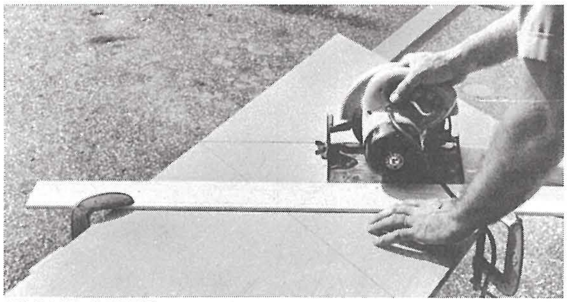
tables in the center. Add five pairs of cleats to the inside and three swivel casters on the bottom.

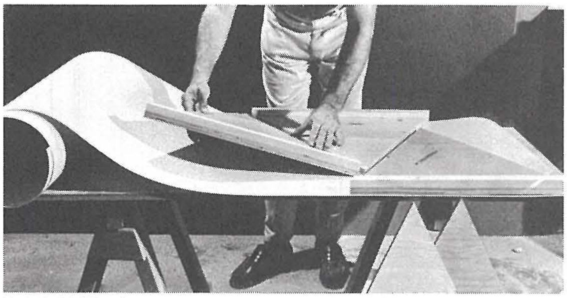
Use a plywood blade to cut the five triangular tabletops to minimize sanding of the side edges, which will be left exposed and simply painted. Double up the table fronts by adding ¾ x 1½-in. strips after jointing the front edges smooth. Cut the laminate (with knife or scratch awl) about ¼ in. oversize. Apply contact cement to both surfaces; apply the laminate.

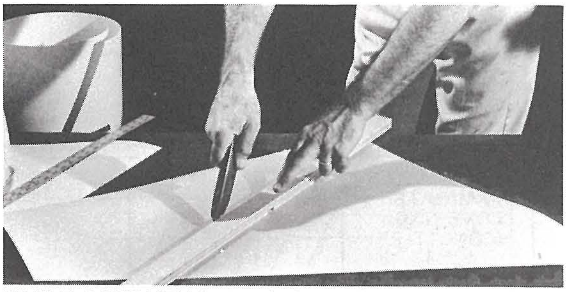
The top and base of the main table are built up to double thickness around the edges to provide a "thick look." You can rough-cut the top and bottom panels, glue on the extra strips, and then cut to the required dimensions. A bandsaw is best for this, but you can do it with a sabre saw. In either case, the edges must be trued up with a stationary disc or belt sander. Since the edges are curved, it will be easier to apply the edge trim in two or even three sections, rather than work with one continuous strip.

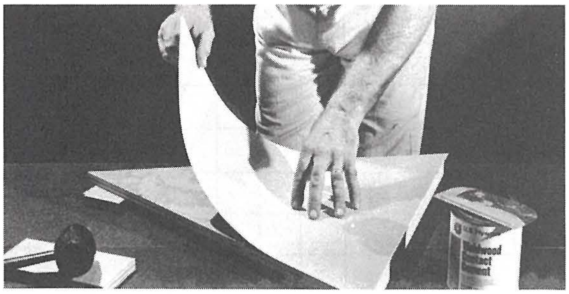
After the edge trim is applied to the top and base, proceed to add the laminate to the outer portions of the base top surface. Do *not* laminate the tabletop until after the unit is completely assembled. Mark off the positions of the dowel holes and bore small pilot holes through both base and top at the same time to guarantee alignment. Then bore 1⅛-in. holes for the dowels; ⅝ in. deep in the base, and all the way



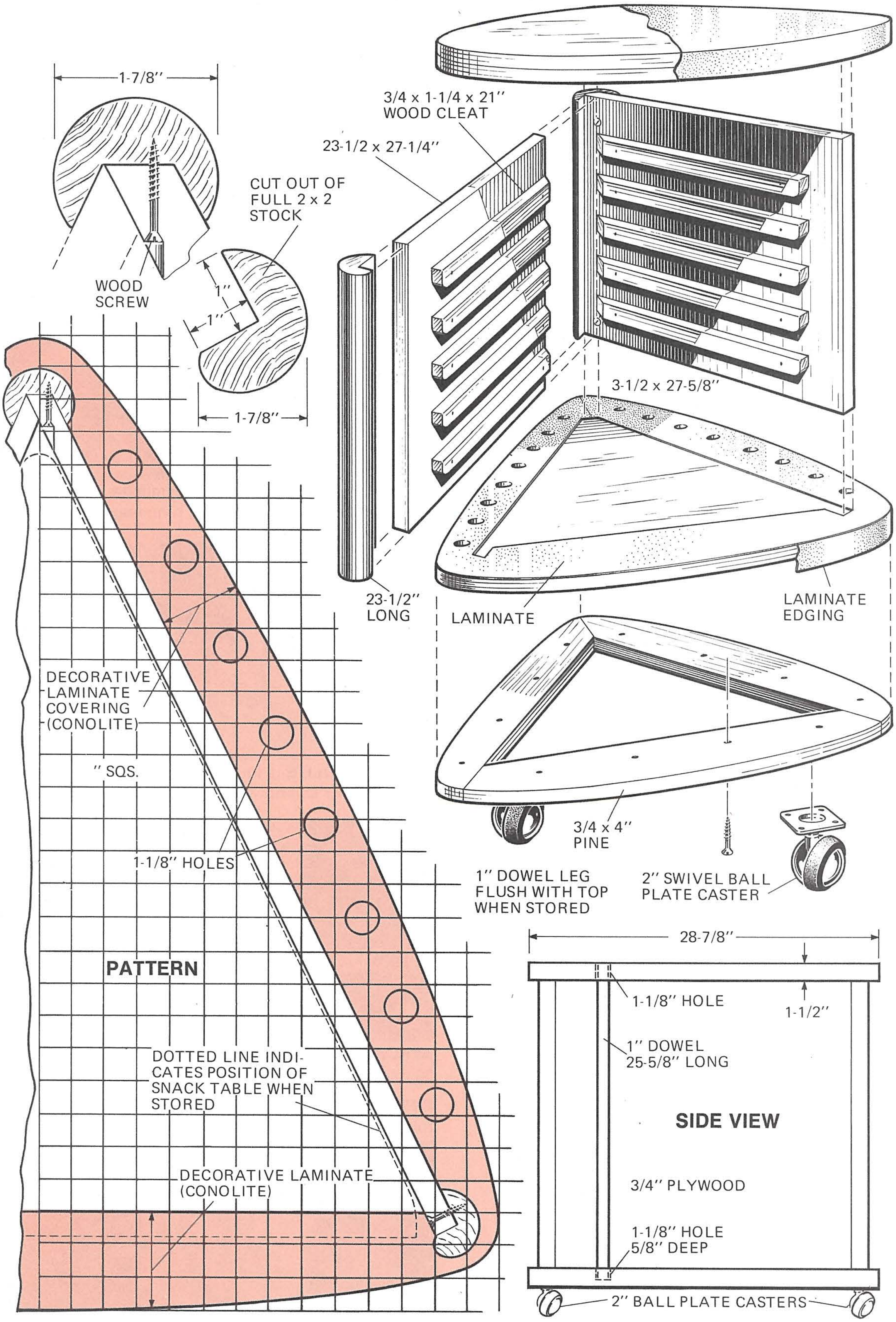

CLAMP GUIDE to work and use a smooth-cutting plywood blade. You can get two tops from a 2x4-ft. panel.

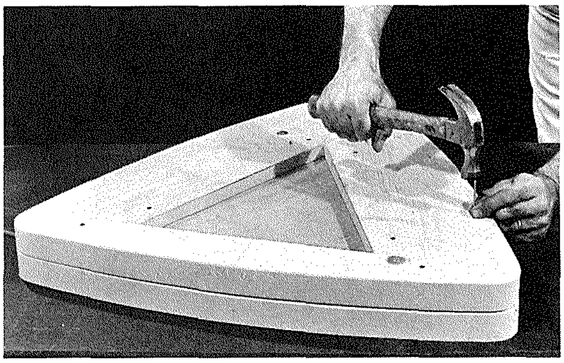

LAY OUT triangular patterns on laminate; allow at least ¼ in. waste all around for final trimming.

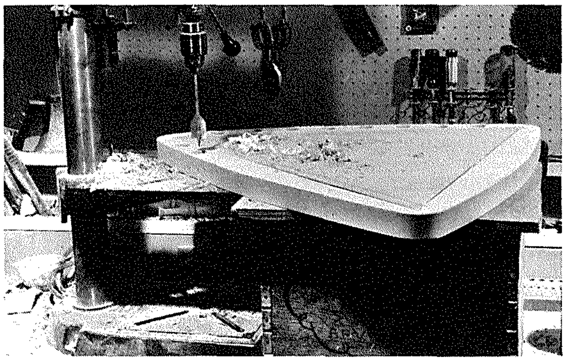

WHILE CONOLITE is tough, it can be cut with a sharp utility knife or scored with an awl and snapped off.

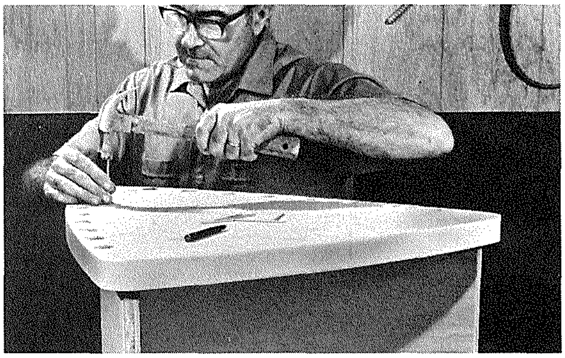

APPLY CONTACT cement with notched spreader, let set 30 minutes. Tap laminate with a block for good bond.

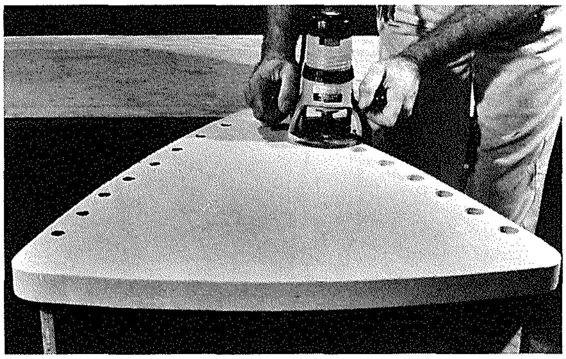
FINISH OFF the edges with a router and a bevel cutter set for very slight cut. (Can also be done with file.)

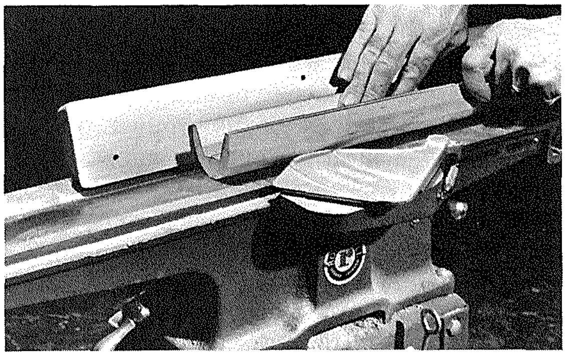

1-7/8"
WOOD SCREW
CUT OUT OF FULL 2 x 2 STOCK
1"
1"
1-7/8"
3/4 x 1-1/4 x 21" WOOD CLEAT
23-1/2 x 27-1/4"
3-1/2 x 27-5/8"
23-1/2" LONG
LAMINATE
LAMINATE EDGING
DECORATIVE LAMINATE COVERING (CONOLITE)
" SQS.
1-1/8" HOLES
3/4 x 4" PINE
1" DOWEL LEG FLUSH WITH TOP WHEN STORED
2" SWIVEL BALL PLATE CASTER
PATTERN
DOTTED LINE INDICATES POSITION OF SNACK TABLE WHEN STORED
DECORATIVE LAMINATE (CONOLITE)
28-7/8"
1-1/8" HOLE
1-1/2"
1" DOWEL 25-5/8" LONG
SIDE VIEW
3/4" PLYWOOD
1-1/8" HOLE 5/8" DEEP
2" BALL PLATE CASTERS

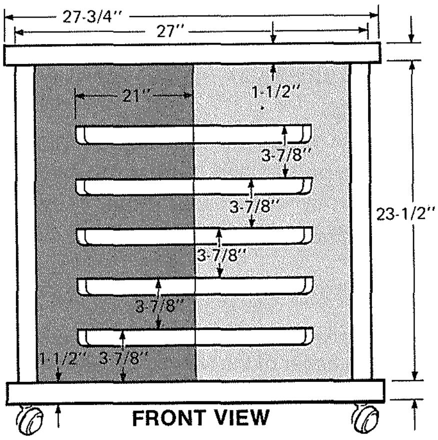

MARK OFF and drill pilot holes through top and bottom at the same time to align dowel holes in the base.


SUPPORT THE HEAVY pieces on drill press for a neat drilling job. Holes in the base are only ⅝ in. deep.


HOLD OFF laminating plywood top until it's glued and nailed to the sides with 2½-in. finishing nails.


BORE UNDERSIZE holes in plastic covering 1-in. holes, then rout to conform to the diameter of holes below.


FORM THE TRIM pieces on the jointer, being careful not to trim fingers. Complete shaping with a sander.



through the top. Add the laminate to the side panels.

The reason the plastic is not applied to the top until after final assembly is to permit nailing the top into the sides. Use glue and 2-in. finishing nails. Although the dowel holes are already bored in the top panel, the laminate is applied in a solid piece without attempting to predrill and align the holes. When the top is laminated, simply bore holes just large enough to allow the router bit to penetrate; then rout them to size.

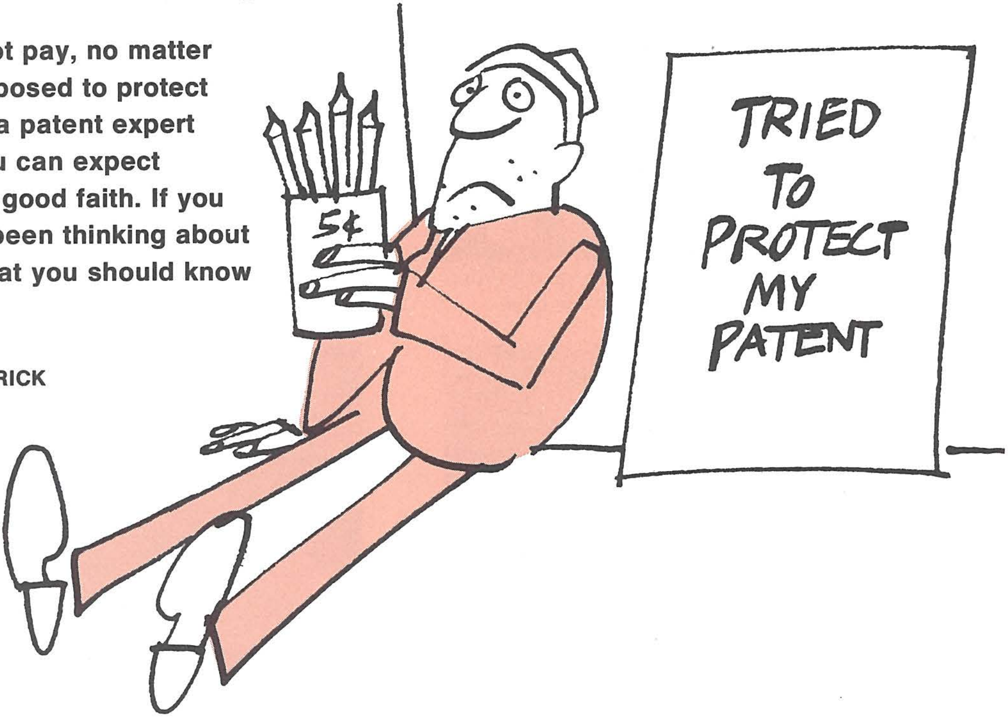
Make the vertical wood trim for the front and back corners by first doing the required inside cuts, followed by a few angled cuts on the table saw. You can further shape them close to size on the jointer by continually changing the angle of the fence. But watch your fingers.

Some tips on painting: Tack lengths of wire to the bottoms of the dowels and hang them on a line for easy spraying semigloss black. Give edges of individual tables a coat of wood sealer before you paint them with a brushing lacquer.

Do patents pay?

Patents may not pay, no matter how much they're supposed to protect your invention. Here a patent expert tells you what you can expect for your money and good faith. If you have an idea you've been thinking about protecting, here's what you should know

By FRANK M. BUTRICK


5¢
TRIED TO PROTECT MY PATENT

■ IN 1960, an ingenious Clevelander invented and patented a device used in setting up jigs and fixtures on machine tools. When his patent was issued, he proceeded to manufacture and market the device.

The unit was not a financial success, but the basic concept intrigued most men who saw it—so much so that within a very few years the inventor had accumulated three competitors, all simply making copies of his product. Two of these were small firms, like the patent owner, and the third was a very large one.

The first competitor was successfully frightened off with a couple of nasty letters from the inventor's attorney. The second one had to be sued. The patent owner spent over $3000 and never even got to court. The infringer was able to prove that he had netted less than $1000 profit, and the patent owner settled for $1500, a bad bargain. But when he took on the giant firm, things got rougher. He gave up when his legal fees passed the $5000 mark, again without getting to court.

Ironically, what none of these people knew was that the patent had been anticipated by prior publication in the "Gadgets" section of a magazine, *The Tool Engineer,* in 1949. Not only

And if somebody roosted in a well-stocked library . . ."

The author, a former patent consultant, is assistant marketing manager of the National Twist Drill & Tool Co.

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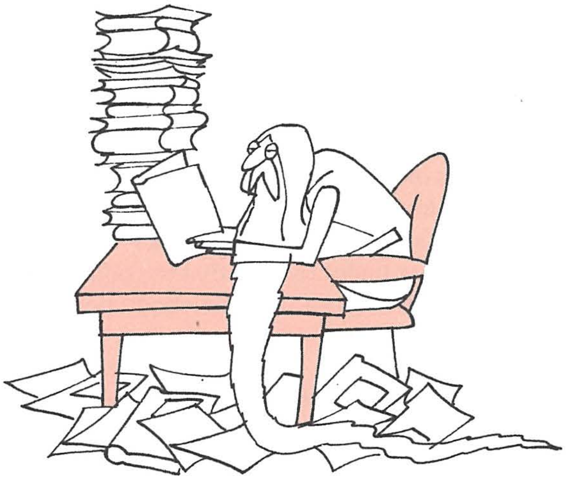
that, but in two subsequent issues other contributors to this magazine had submitted improvements on the idea originally published.

In short, there were three prior publications. So, in spite of the time, money and energy expended by individuals in three firms, the patent was worthless in the first place.

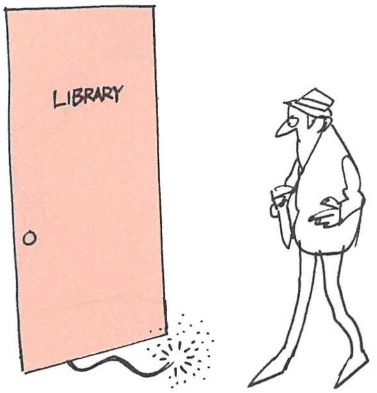
Is a patent worth having? Yes—IF and the if is a big one—IF the only infringers are likely to be smaller than yourself, with smaller legal budgets. IF the long price has been paid for an absolutely exhaustive search of prior American patents. IF an equally exhaustive search has been made of foreign patents. And IF somebody roosted in a well-stocked library long enough to assure the applicant that his idea has not previously been published in any of the thousands and thousands of technical books, papers, magazines and trade journals.

Or, looked at another way, IF the applicant is reasonably certain his potential competitors are no more willing to make such a serious search than he is.



"You could easily exceed the 17-year patent life just searching."

Part of the routine process of getting a patent is a patent search—prior-art research, normally conducted by the patent attorney or his office or agent, to see if the subject of the application has been anticipated in an earlier patent. Individuals and industry spend many, many thousands of dollars each year going through this process. Each of these individuals and corporations assumes when his patent is issued that he has, in effect, a license to make the product described and to exclude others from doing so.



"Every library is a time bomb."

Yet how valuable is such a patent? Apparently this is left up to a court (after expensive litigation) to determine because a patent is worthless if it defies a number of prohibitions:

1. The idea must not be the mere exercise of ordinary engineering skill.
2. The idea must not be the substitution of new devices, materials, or components for those used in the past.
3. It must not be mere enlargement of a previous device.
4. It must have more than just change in form, proportions, degree, or arrangement—especially when no new principles or functions are involved in the device itself.
5. It must not be just unification or multiplication of parts, converting from manual to power, making a device movable, adding or omitting parts or functions, and so forth.

In short, only a search of formidable thoroughness through previous patents gives any assurance that a given patent is valid—and it has to be taken to court for an opinion, in order to be certain.

To strictly satisfy the law, the inventor must do the following:

1. Be certain that his idea was not known, or used by others.
2. Make a search through *all* patents in this *and* all foreign countries!
3. Make a search through *all* applicable publications in this *and* all foreign countries!

When a patent attorney makes a "patent search," how hard does he look? With no disrespect intended, a patent attorney must operate at a profit and yet must charge a price clients con-

"Patents can be fun—but one should not take them too seriously."

sider reasonable. So the patent attorney, like any other businessman, must tread a narrow line between doing the best possible job and doing a reasonably priced job.

In short, the average patent search probably will turn up a dozen or fewer prior patents. Most of even this superficial searching is done under adverse circumstances—hurriedly, and by people who may have a broad technical knowledge but are unlikely to have a deep knowledge in the specific engineering or scientific concepts involved.

Further, a search usually goes back only a few years. It will include at least a cursory examination of patents still in effect, but few people are naive enough to believe that they are paying for a search of all possible prior patents of all countries, regardless of how old. In short, a patent search is usually so incomplete that it is of no value.

Remember that United States patents are approaching the 4-million mark and about 10 foreign countries are in the 1.5-million range. Many of these foreign patents are duplicates, but the total number of the world's patents still probably is in the neighborhood—and it's a big neighborhood—of 20 million. You could easily exceed the 17-year patent life just searching.

There are many fields in which we operate today that are new. But while the fields may be new, many of the problems being solved are old ones. The field may be aerospace, but the patent application may be for a mechanical latch or a pressure-proof seal or a timing device. Problems in these areas were being solved 100 years ago—and patented. You can't really expect a patent attorney to look that far back.

checking out foreign patents

And foreign patents: It must be assumed that no attempt at all is made to search through foreign patents. It will not be known if the idea was anticipated in London or Hamburg or Vienna three (or 30) years ago because the patent attorney is not paid to look there. But a competitor, blocked by your patent, might!

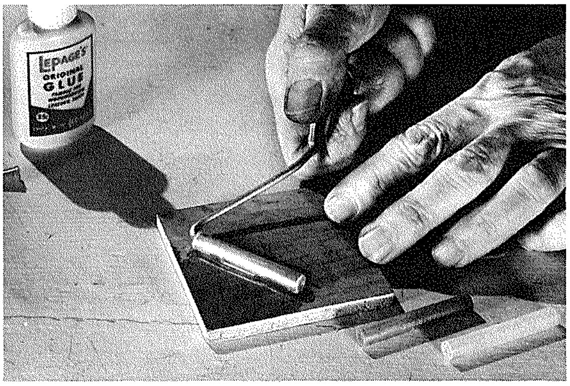
And as to prior publication—this is Pandora's box. There is no practical way of knowing what may lurk in the world's consumer, trade, and technical journals, which number into the thousands in this country alone. Reliable estimates place U.S. business publications alone at 2300. It is impractical to even think in terms of looking—and yet every library is a time bomb, just waiting for a competitor to find something that can blow up in the inventor's face.

All of which brings one to the conclusion that it might be relatively easy to dislodge any apparently impregnable patent, that is to say, one owned by a competitor. Pack a lunch box and head for the nearest major public library. Take a large stack of old magazines in the field involved and begin looking.

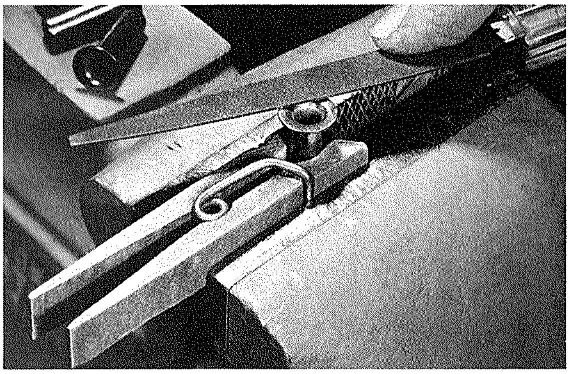
It may take days—perhaps weeks—but there is so little new under the sun that the odds are all in favor of finding out that somebody beat your competitor to the idea back in 1932 (or whenever). Take the result of your search to a good attorney; he probably can make a successful case in support of the claim that your competitor's patent is invalid.

A patent is a beautiful thing when properly framed and hung on the office wall. But the true practical value of the patent is very suspect. If the patent has been assigned to one of the nation's 500 largest, it is probably a good patent, simply because it can be defended to whatever financial extent is found desirable. But if the assignee is not a gigantic corporation—and particularly so if the patent embodies something that can be marketed at a good profit and thus is attractive to larger firms—the thoughtful inventor will make certain that his brother-in-law is an attorney.

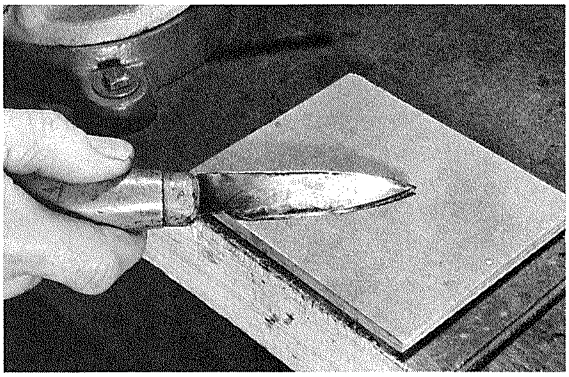
Patents can be fun—but one should not take them too seriously.



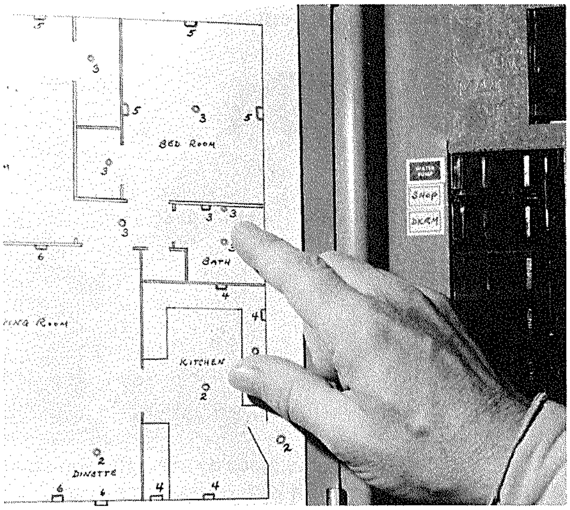
AN EMPTY PEN ink cartridge makes a dandy glue spreader when fitted with a "paint-roller" handle. The plastic cartridge is virtually self-cleaning since most adhesives can easily be peeled off when dry. Unlike a paint roller, the cartridge does not turn. It fits tightly on its wire handle and simply spreads the adhesive with a wiping action.



A SPRING-TYPE CLOTHESPIN will solve the problem of holding small-diameter tubing, plastic rods and other fragile work in a vise without damaging it. Cradled between the wooden jaws, the work is cushioned and protected and can be safely clamped in a regular vise. You should exert only a little pressure when tightening the vise.



A SHARPENING PAD on your benchtop is extremely handy for keeping a keen edge on a knifeblade or other cutting-edge tools. Simply fasten an abrasive-covered wood block to the bench where it won't interfere with other work. Pick a fine-grit abrasive, cloth or paper, and glue it to the block; then fasten the block to the benchtop with two small brads. Brush away all dirt before using the pad.

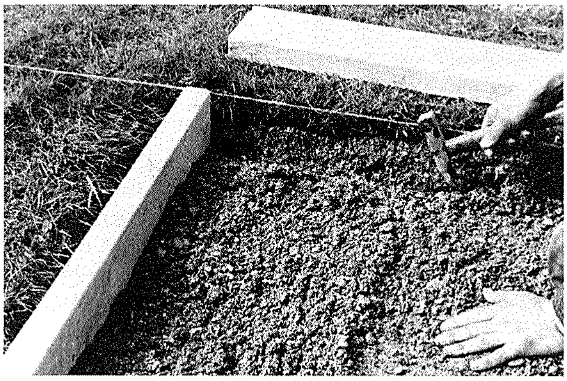


A NUMBERED MAP posted near the circuit breaker or fuse box which shows all the electrical outlets in the house can be a real timesaver. When a fuse blows, you can pinpoint it quickly, or if you want to kill a certain circuit to work on it, you know immediately what breaker controls it by its number.

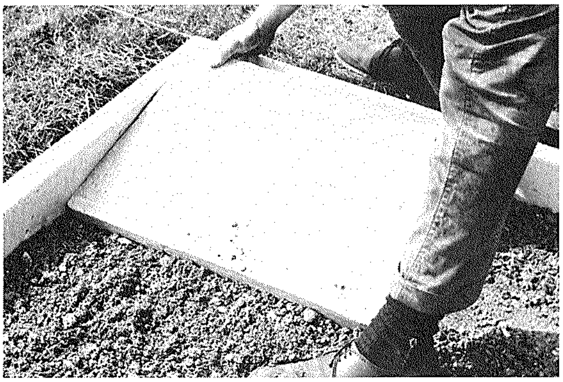
To make such a map, draw a floor plan of each floor and spot the outlets and ceiling lights on it. Now trace through the lights on each circuit by killing them, one at a time, and noting which outlets each controls. Most fuse and breaker boxes have each circuit numbered, and each outlet on the map is given a corresponding number.

Handsome garden paths and walkways

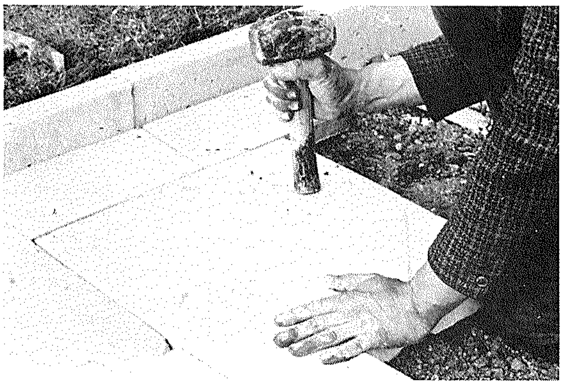
By PETER OLDALE



BREAK UP top soil and scoop out narrow trenches for wooden curbs treated with a good preservative.



CAREFULLY POSITION slabs over the loose soil. It's a worthwhile idea to chart your layout of slabs first.



TAMP THE SLAB firmly into place by using the handle of a hammer—never pound it with a hammer's head.

SEE ALSO

Asphalt driveways . . . Concrete . . . Gardening . . . Landscaping . . . Lawns . . . Patios . . . Retaining walls . . . Steps . . . Transplanting . . . Trees

▩ A GARDEN PATH made from blocks of stone or concrete is strong, durable, easy to lay (apart from the actual labor of carrying the slabs) and can be done in colors, materials or patterns to blend with almost any style of house or garden.

Yard for yard, slabs of concrete are on the low-cost side, but stone is a different matter. Dressed York Stone slabs are one of the most expensive materials obtainable.

Steps for garden paths can be plain gray concrete (the cheapest), colored concrete, textured concrete cast to imitate the irregularities of natural stone, or concrete that's topped with inlaid pebbles or stone chips. Common shapes are square, rectangular, hexagonal or octagonal, all suited for layout in many patterns. Great care must be taken with the colored slabs, however, or unnaturally garish effects may be produced. A single slab, viewed in a building supply yard, may seem subdued in shade, but a whole path or drive in this same material could appear impossibly bright.

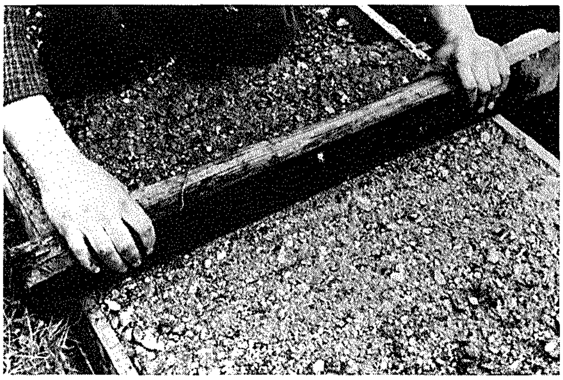
Before ordering, lay a few slabs together on the ground and, if possible, wet them down—the color of wet slabs is markedly deeper than that of dry ones, and a path that looks restrained in summer may darken unpleasantly in winter rains.

Slabs are usually sold by the piece, thus the actual cost *per square yard* will be greater for small slabs than for larger ones. Paths and drives should be planned for widths that can use standard-sized slabs, thus eliminating a need for cutting.

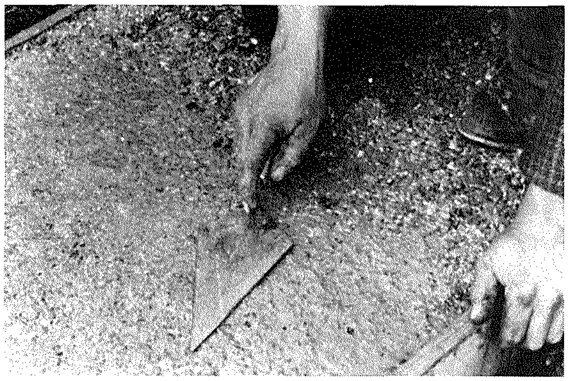
Where a pattern of various-sized slabs is desired, work out beforehand the exact number of each size needed. In general, avoid patterns using large numbers of small pieces. These are hard to lay, susceptible to wear and expensive.

Octagonal and hexagonal slabs will not make a straight-edged path by themselves, so halves (for edges) and quarters (for corners) are needed. Again, detailed planning will give the required number of each kind. Paths laid out with these slabs should have only parallel edges and right-angled or 45° corners. Other angles are very difficult to lay satisfactorily.

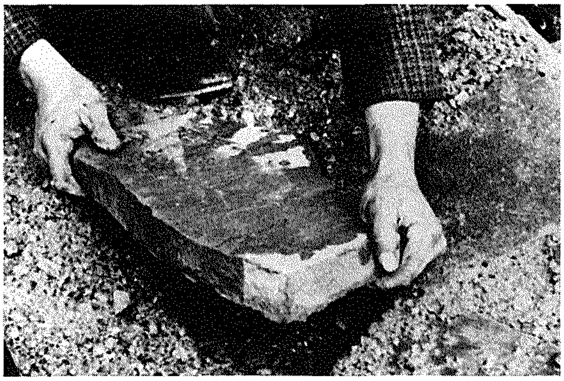
Inlay stones in a concrete bed



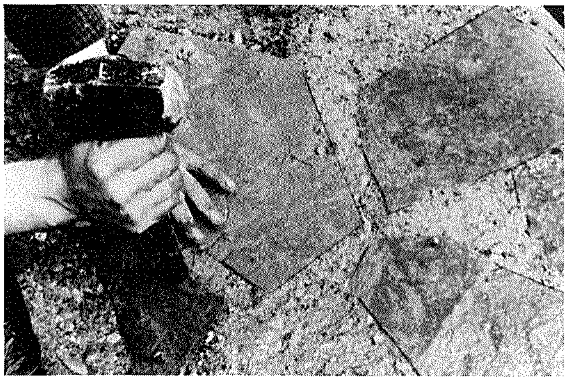
POUR A BED of concrete and beat the mix down with a length of lumber. Make sure the form is level.



USE A TROWEL in pounding fashion to bring fuzzy finish to the surface. Smooth walks can be dangerous.

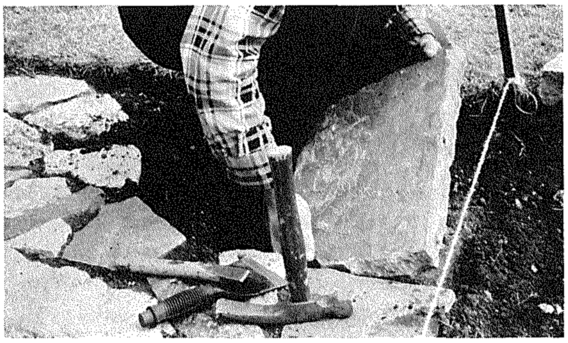


WHILE CONCRETE is still setting up, scoop out portions and inlay stones, slabs or other material.

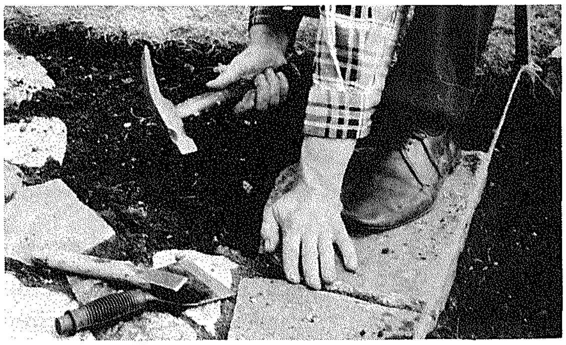


TAMP DOWN until level. The cement will be forced up between the joints to be flush with the surface.

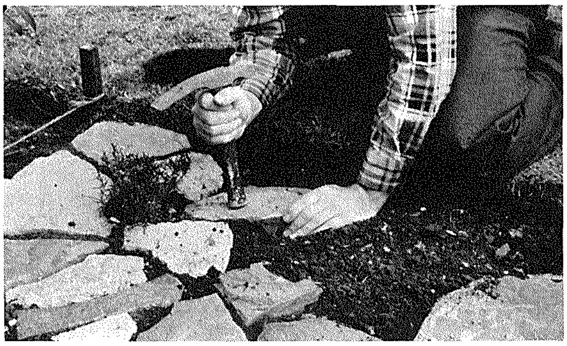
Lay a path with built-in greenery



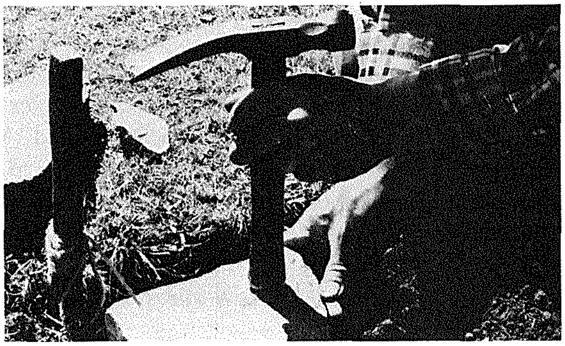
POSITION EACH STONE carefully on a bed of soil and sand. It's best to start with the edge stones.



STAND ON THE STONE and pound the soil under its edges to consolidate soil and level the stone.

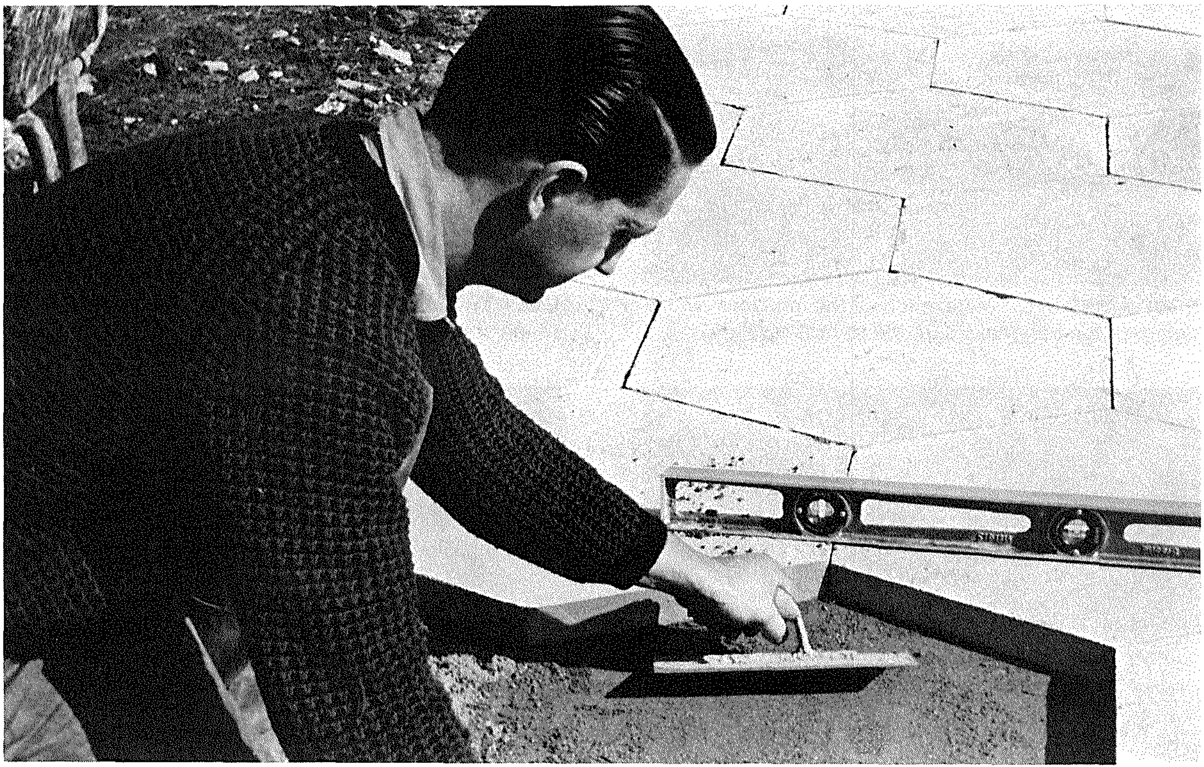


BE VERY CAREFUL when tamping stones around small plants. Otherwise you can damage the roots.



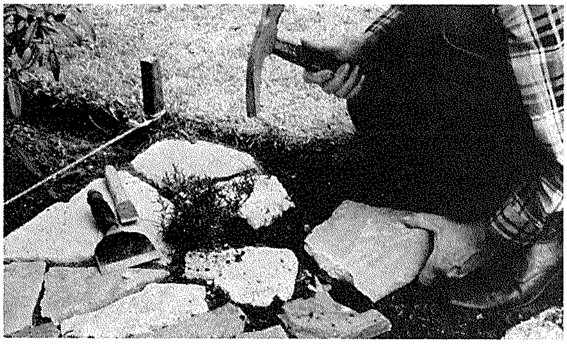
CORNER STONES should be as square as possible to maintain clean lines of the path or walkway.

Use hexagonal slabs for a truly distinctive touch

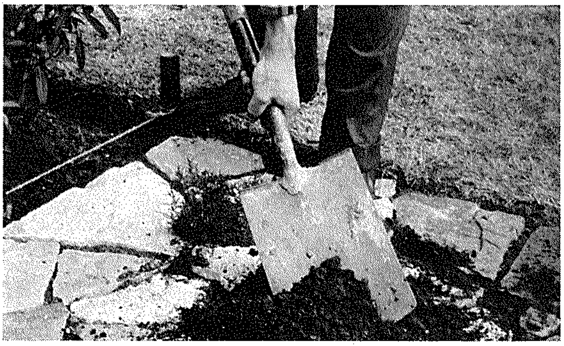


CONCRETE BLOCKS of this size require a high standard bed of pure sand or sand/cement dry mix. It's important to smooth the bed carefully for every concrete slab you lay, making sure it's perfectly level.

INSERT CREEPING plants, such as thyme, or small plants, such as rosemary, as the work progresses.

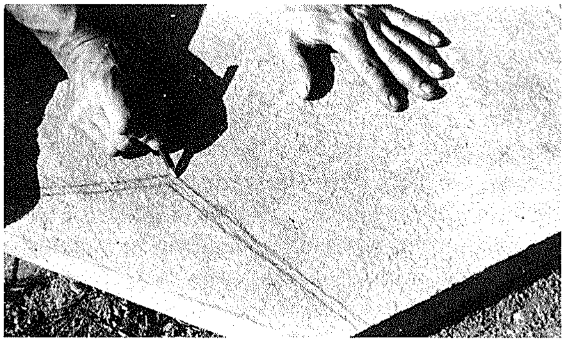


IF NECESSARY, you can chip stone to fit awkward-shaped areas, but always wear safety goggles.

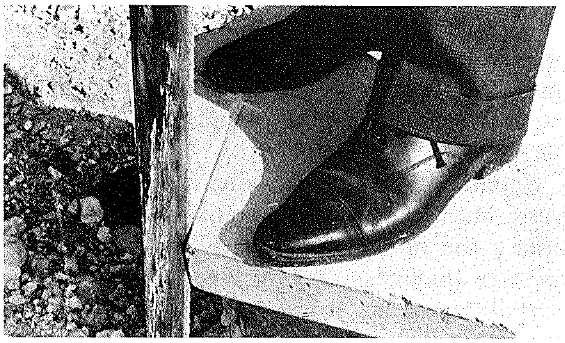


SPREAD FINE SOIL over the completed walkway. It often is advisable to sift all of the topsoil first.

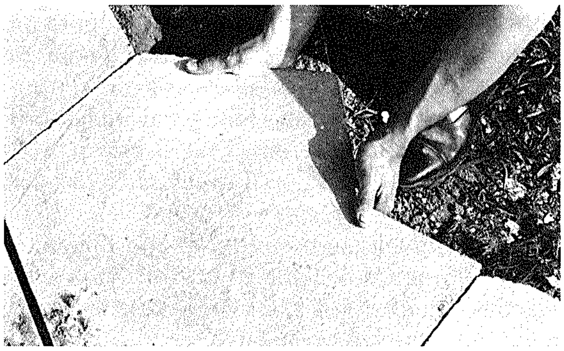
BRUSH THE SOIL into all the cracks and crevices at the butt joints to produce a well-defined walkway.



WHERE A BLOCK must be cut, make a pair of guide lines; each should be about ¼-in. off the desired cutline.



USE A MASONRY saw to cut between the drawn lines, applying water liberally to lubricate the saw.



LOWER THE CUT block gingerly into place on the bed, making sure that the smooth bed isn't disturbed.

FINE, SIFTED SAND is then brushed into all the cracks until every joist in the walk is completely filled.

continued

Laying an asphalt path

POUR A GENEROUS AMOUNT of gravel on top of a firm foundation and rake it until it's spread evenly.

BREAK OPEN the bags of asphalt and pour this on top of gravel bed. Asphalt comes in several colors.

RAKE OUT asphalt at once. Heating the head of the rake over a low flame makes the raking task easier.

A SPRINKLING of colored chips will break the solid color and improve the appearance. Then roll the path.

Stone paving can be *random-squared* (various irregular squares or rectangles fitted together in patterns), or it can be *crazy paving*—broken flat stones fitted together in the manner of a jigsaw puzzle.

Squared slabs can be bought by the square yard, but most stone is bought by the ton. The area a ton of stone will cover depends on its average thickness and its type. Sandstone, in particular, varies somewhat in its weight per cubic foot. The most direct method of finding out the amount to order is to telephone the materials dealer and ask how much of his particular stone will be needed for the area you wish to cover.

Delivery costs can account for a large part of the price since most quarries will not deliver less than a full truckload—say five tons. If this quantity is not needed, it may pay to seek a neighbor who also is thinking of laying a stone path, and share the load.

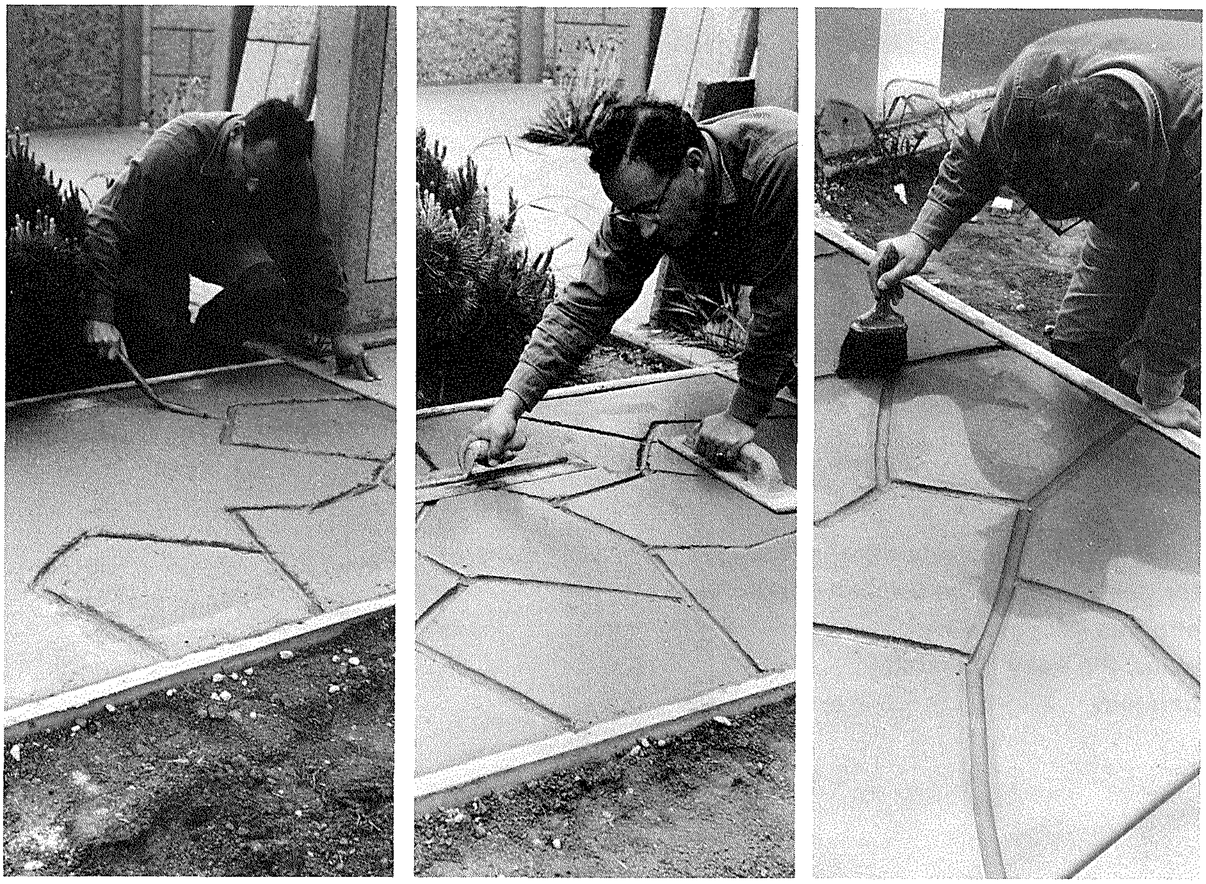
Small orders can be collected direct from quarries at a comparatively low price—and if a truck can be borrowed, this is the most economical method of purchase. Do not be tempted, however, to overload a small truck with great heaps of stone. Five or six hundredweight of crazy paving doesn't look very heavy, but it is better to make extra trips than to ruin the suspension or springs.

Garden centers, on the other hand, will deliver almost any amount, however small, but the cost per ton is high. The cheapest solid material is broken concrete slabs, often available from public works authorities, and these can be laid down as "crazy paving" in the same way as stone.

Unquestionably the simplest of all paths to make is the plain gravel type, which consists essentially of a layer of gravel spread between some sort of curbing. The actual gravel may be either shingle (pebbles) or stone chips; both are available in various sizes and colors. There are also a number of gravels (known as *self-setting*) containing coarse clean stones and a high proportion of finer material. This causes a well-rolled layer of this material to set much like soft concrete.

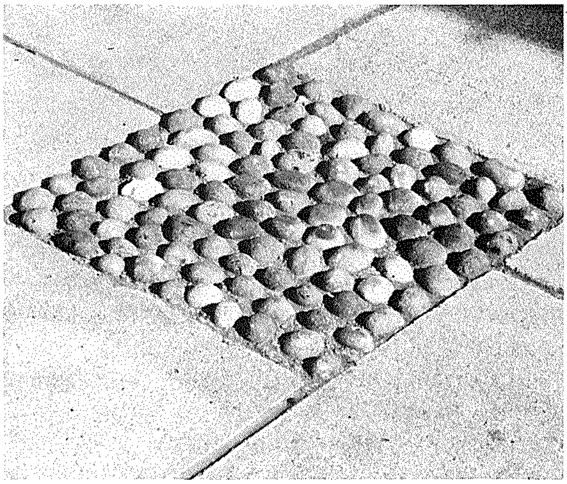
Loose gravel can be rolled to consolidate it, but it will never become truly firm. However, this has its advantages, for even paths in a very poor state can be vigorously reraked to look almost new. Loose gravel should be about 2 in. deep for chips, less for shingle.

Tool flagstone joints in concrete

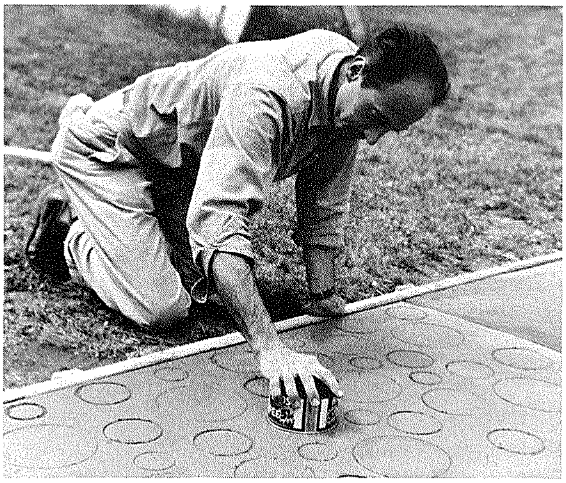


MAKE A scoring tool out of a long piece of ½ or ¾-in. copper tubing by bending it in an S-shape. Use it to score a random flagstone pattern in the still-wet concrete (above left). Once you notice that the water sheen has completely disappeared, float and trowel the surface (center), and finally, use a short bristle brush to touch up all of the joints to give a finished appearance (above right).

Decorative effects cost little, add much



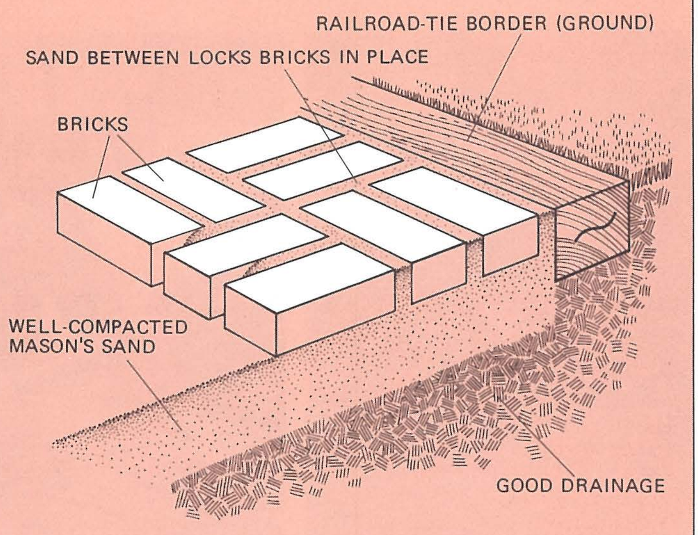
STONES SET into square of concrete will create a novel pattern to offset a path otherwise made of gray-colored concrete blocks or plain-looking slabs.



SIMPLE CIRCLES can be made to add life to a walkway made of cement. After the surface has been troweled smooth, use a can to make the impressions.

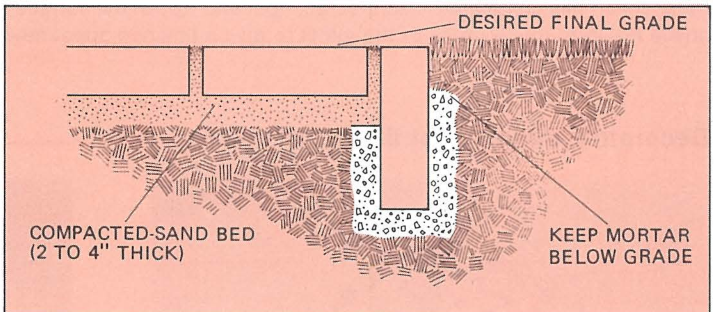
How to build a brick-in-sand patio

Looking for an extremely attractive patio? For good reason, the brick-in-sand patio has become very popular. It's easy to install and maintain


RAILROAD-TIE BORDER (GROUND)
SAND BETWEEN LOCKS BRICKS IN PLACE
BRICKS
WELL-COMPACTED MASON'S SAND
GOOD DRAINAGE

TOOLS YOU'LL NEED	TOOLS THAT MAKE THE JOB EASIER
HAND TAMPER MATTOCK OR PICK 2-FT. SPIRIT LEVEL MASON'S LINE (HEAVY) HAMMER SAW ROAD BROOM MASON'S CHISEL SHOVEL RAKE	BRICKLAYER'S HAMMER PORTABLE ELECTRIC SAW SLEDGE HAMMER

Types of borders (grounds)



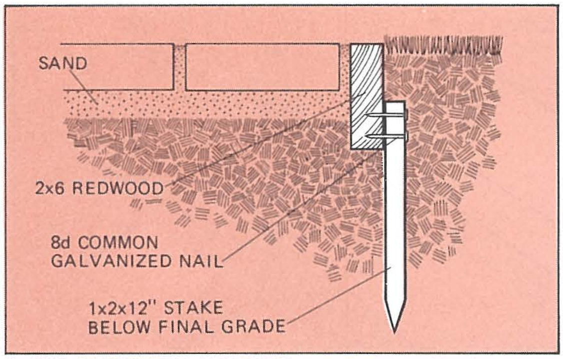
FOR A BRICK-ON-END border, bricks are set in a mortar footing placed in a trench that's at least 6 in. wide and 10 in. deep. Pour the mortar in the bottom of the trench and set the bricks in place. Tap the bricks gently to seat them in the mortar and check the row occasionally with a spirit level. Then place mortar on both sides of the bricks and tamp it firmly with a short length of 1x2 lumber.

■ THE DICTIONARY says that a patio is a "walled-in courtyard open to the sky." But today, perhaps, that description doesn't exactly fit the typical American patio. Walled-in? Yes in some cases, with shrubbery or privacy screens. Open to the sky? Sure, but many homeowners add a roof to gain use during rainy weather. A better, and contemporary, description is that a patio is an outdoor living room.

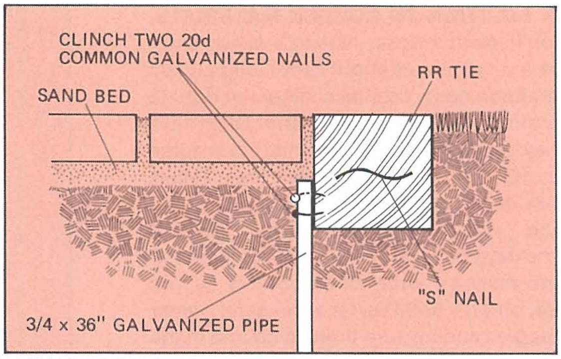
SEE ALSO

Barbecues . . . Benches, deck . . . Carpeting, outdoor . . . Concrete . . . Cookout bars . . . Decks . . . Firepits . . . Garden shelters . . . Grill houses . . . Picnic tables . . . Planters . . . Retaining walls

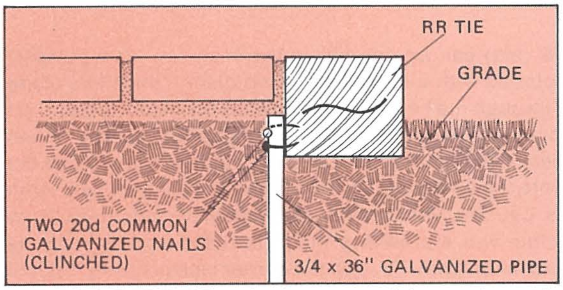
Of the many types of patios you can choose from, a brick-in-sand patio—no matter which border you prefer—remains attractive throughout the years. Unlike concrete, it won't crack or settle, and because water will drain through rather than run off, it can be perfectly level. That's a plus when it comes to arranging your



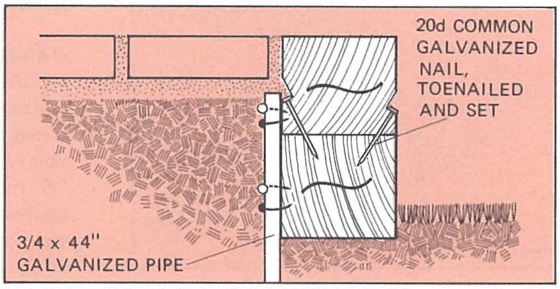
A 2X6 REDWOOD BORDER needs less digging once the grade has been determined. Set a stake, establish the grade at that point and nail the 2x6 to the stake. Level the 2x6 and nail to a second stake at the other end. If the 2x6 hangs in the air at either point, prop it with a brick to the desired level and backfill outside of the border with soil. Gentle sloping of the soil may also be required or a second border can be added.


CLINCH TWO 20d COMMON GALVANIZED NAILS
RR TIE
SAND BED
"S" NAIL
3/4 x 36" GALVANIZED PIPE

RAILROAD TIES may be set in an excavated trench to be flush with the grade and the inside area excavated for the sand bed. To prevent ties from "rocking," drive in galvanized pipes as shown and clinch a pair of 20d galvanized nails around the pipe. Ties come in 6x8 and 7x9-in. sizes, each 8 ft. long. They're heavy—approximately 210 pounds each—so make certain you have help available on the day that you set them.

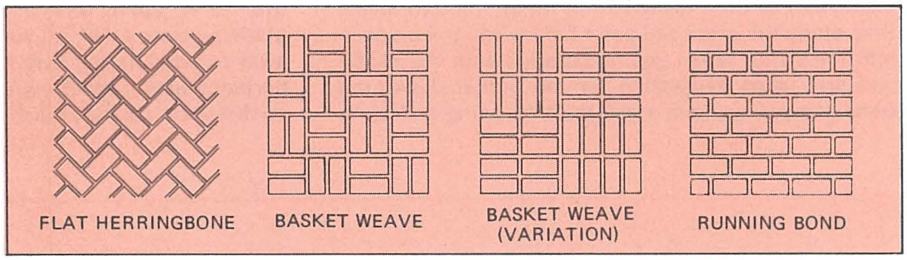

RR TIE
GRADE
TWO 20d COMMON GALVANIZED NAILS (CLINCHED)
3/4 x 36" GALVANIZED PIPE

FOR A STEP EFFECT, a single course of ties can be set in a very shallow trench. If the ground slopes away sharply, the ties may be stacked at the low point two ties high. Again, a minimum of interior excavation is required, but you should dig down to assure good drainage before placing the sand bed. Pipe "stabilizers" are a must here—every 4 ft. at least.


20d COMMON GALVANIZED NAIL, TOENAILED AND SET
3/4 x 44" GALVANIZED PIPE

NOTICE THAT THE PIPE STABILIZER on a double course border spans both ties with nails driven into each of them. The ties should also be toenailed at the sides using the same-size nails. Since this wood is very dense, drilled pilot holes may be needed. Nailheads can be set flush with a heavy nailset, but with a rustic effect, this is of minor concern.

FOUR OF THE most popular brick patterns are shown in the drawing at the right. No matter which you choose, you'll have a bit of "make-up" (adjustment) to keep the proper consistency of pattern. The only way to tell is to experiment.



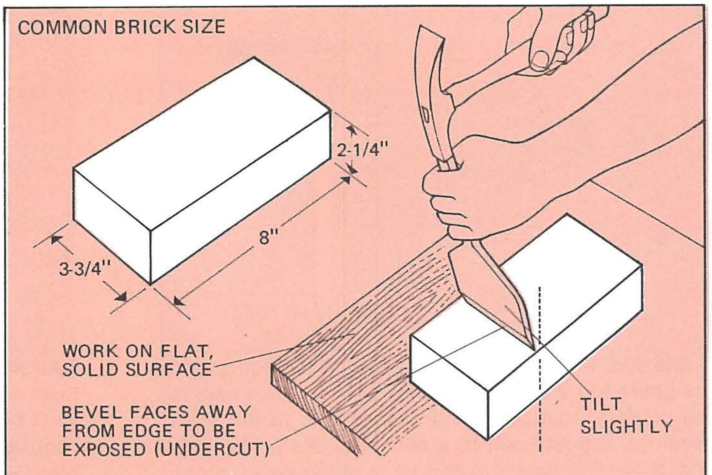
patio furniture. Still another advantage is that damaged bricks are easily replaced in short order.

The bricks you choose can be either new or used. But for attractiveness, the latter hold an edge because of color variation and mortar stains. New common brick costs about the same as used brick.

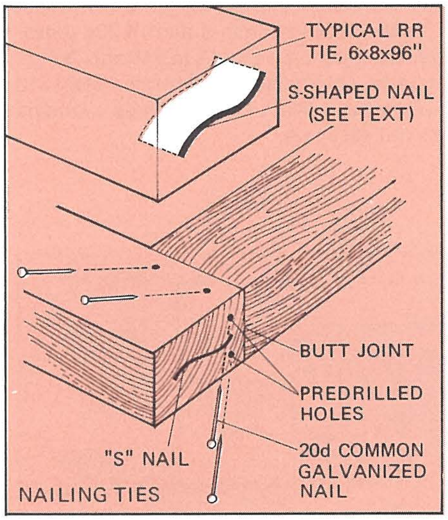
Your first step is to select the patio site. Because it is considered as an outdoor family room, the patio should be placed near a door. This will prove to be convenient when you are entertaining or dining outside.

Borders are a personal choice; railroad ties hold a slight edge among homeowners. You can buy ties from most large nurseries; also check your local classified directory under "Ties, Railroad." Though you can use new ties, used ones are more pleasing to the eye when placed stone-pocked side up.

IN ADDITION TO BORDER MATERIALS, you'll need bricks, mason's sand, sharpened 1x2 stakes about a foot long and 8d common nails. Use the chart at the right to compute your brick and sand. Quantities may vary slightly, but the chart is a guide for 100 sq. ft. of finished patio area. Bricks may be ⅜ to ½ in. apart or butted. To cut one with minimum waste, use a bricklayer's hammer or a 20-oz. hammer and mason's wide chisel. Bricks should rest on a flat solid surface. For safety, wear goggles and be sure there is no one in the path of flying chips.


COMMON BRICK SIZE
2-1/4"
8"
3-3/4"
WORK ON FLAT, SOLID SURFACE
BEVEL FACES AWAY FROM EDGE TO BE EXPOSED (UNDERCUT)
TILT SLIGHTLY

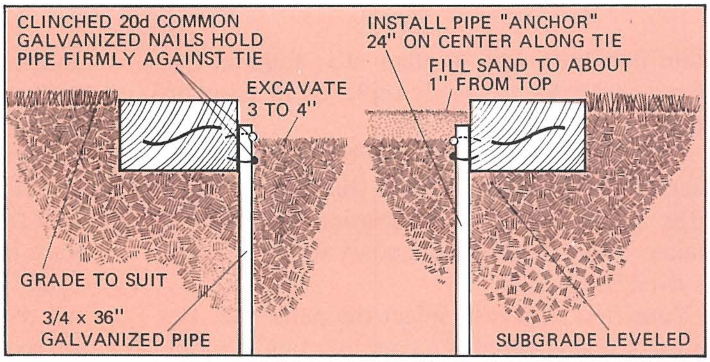
MATERIALS FOR 100 SQ. FT.	CLOSED JOINT (BRICKS BUTTED)	3/8"-1/2" JOINT
BRICKS	500	450
SAND PER 1" DEPTH	1/3 CU. YD.	1/2 CU. YD.



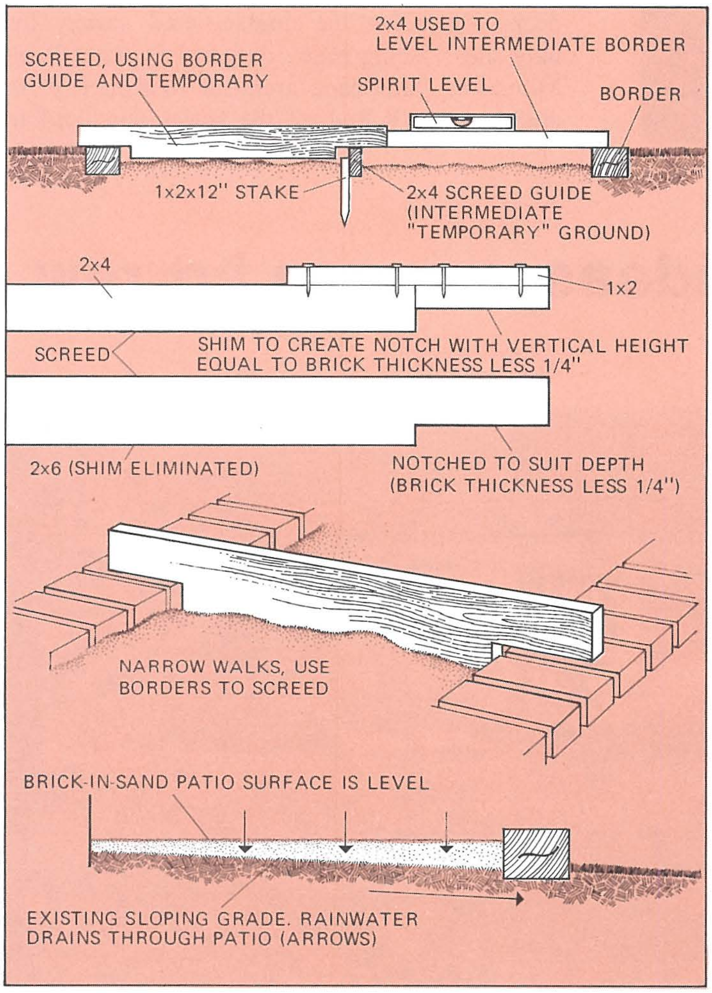
RAILROAD TIES (left) can be cut with a two-man saw or a portable circular saw equipped with a coarse-set or rip blade. Since this blade will not cut fully through the tie, mark cutting lines on all four sides; then make the four cuts, flopping the tie after each pass of the saw. When you're cutting near one end of a tie, make certain that you remove the "S" nail driven into the end grain. In most cases, you can pry it out with an awl and pliers. *Caution:* Railroad ties are creosoted clear through, so wear goggles while you are cutting them. Butt the corner joints as shown; no need to miter them. To keep the corner closed tightly, toenail the joint with hefty nails.

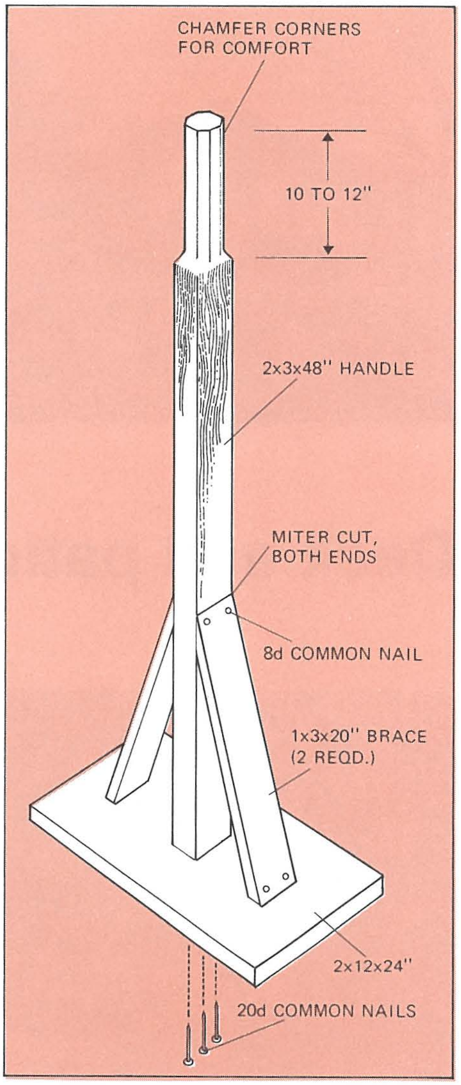
AFTER CHOOSING YOUR PATIO SITE, lay out the area by driving stakes at all points where the direction changes. Fasten a mason's line from stake to stake; then study the proposed patio before you put a spade into the earth. When you're satisfied with the shape and size, start excavating for the border. Level the trench as you go from stake to stake using a straight 2x4 (no more than 12 ft. long) and a spirit level to transfer marks from one stake to another. Where stakes are over 12 ft. apart, drive in an intermediate stake for grade purposes. Tip: As you dig, try to throw soil well away to avoid having to move it a second time. It is important that you check your work carefully at this stage so that you have the proper symmetry for your bricks.

ONCE YOU HAVE LEVELED the trench where the railroad ties will rest, stretch a mason's line to align ties as you place them. Use a pry bar with bricks for a fulcrum for easy lifting where you want to add soil to raise a tie. After leveling each tie, anchor it with 3-ft. lengths of galvanized pipe driven at 2-ft. intervals and attached as shown. Excavate the area with the border of the ties and fill with mason's (mortar) sand. Thorough tamping is a must.


CLINCHED 20d COMMON GALVANIZED NAILS HOLD PIPE FIRMLY AGAINST TIE
EXCAVATE 3 TO 4"
INSTALL PIPE "ANCHOR" 24" ON CENTER ALONG TIE
FILL SAND TO ABOUT 1" FROM TOP
GRADE TO SUIT
3/4 x 36" GALVANIZED PIPE
SUBGRADE LEVELED

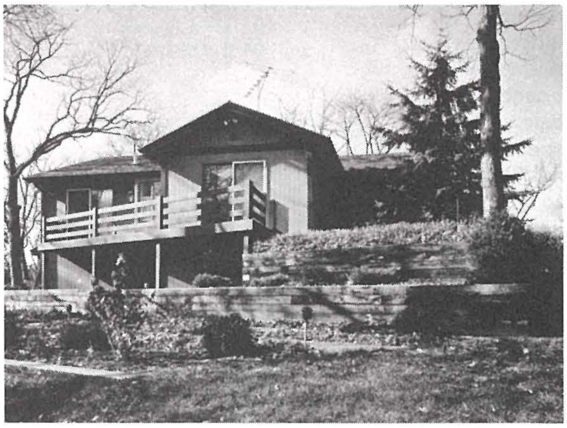
WHEN ALL BORDERS ARE IN PLACE, the interior can be excavated. You should remove all topsoil to provide good drainage (see bottom drawing). Next, fill in this interior area with mason's (stone-free) sand to the top of the borders. After hand-tamping the backfill, screed the sand fairly level using either a 2x4 with shim or a notched 2x6 as shown below. On narrow walks, borders can be used for screeding. For wider spans, you must install a temporary, intermediate ground for screeding. To screed, strike the board side to side to drag sand ahead as you go. Fill low spots from the pile you're dragging ahead of the screed. Finally, compact sand with an overnight soaking from a lawn sprinkler.


2x4 USED TO LEVEL INTERMEDIATE BORDER
SCREED, USING BORDER GUIDE AND TEMPORARY
SPIRIT LEVEL
BORDER
1x2x12" STAKE
2x4 SCREED GUIDE (INTERMEDIATE "TEMPORARY" GROUND)
2x4
1x2
SCREED
SHIM TO CREATE NOTCH WITH VERTICAL HEIGHT EQUAL TO BRICK THICKNESS LESS 1/4"
2x6 (SHIM ELIMINATED)
NOTCHED TO SUIT DEPTH (BRICK THICKNESS LESS 1/4")
NARROW WALKS, USE BORDERS TO SCREED
BRICK-IN-SAND PATIO SURFACE IS LEVEL
EXISTING SLOPING GRADE. RAINWATER DRAINS THROUGH PATIO (ARROWS)



COMPACTING the sand bed is essential so you must have a tamper. While you may rent one from most tool-rental shops, you should consider making yours for permanent ownership. You'll find it a handy thing to have for landscape work.

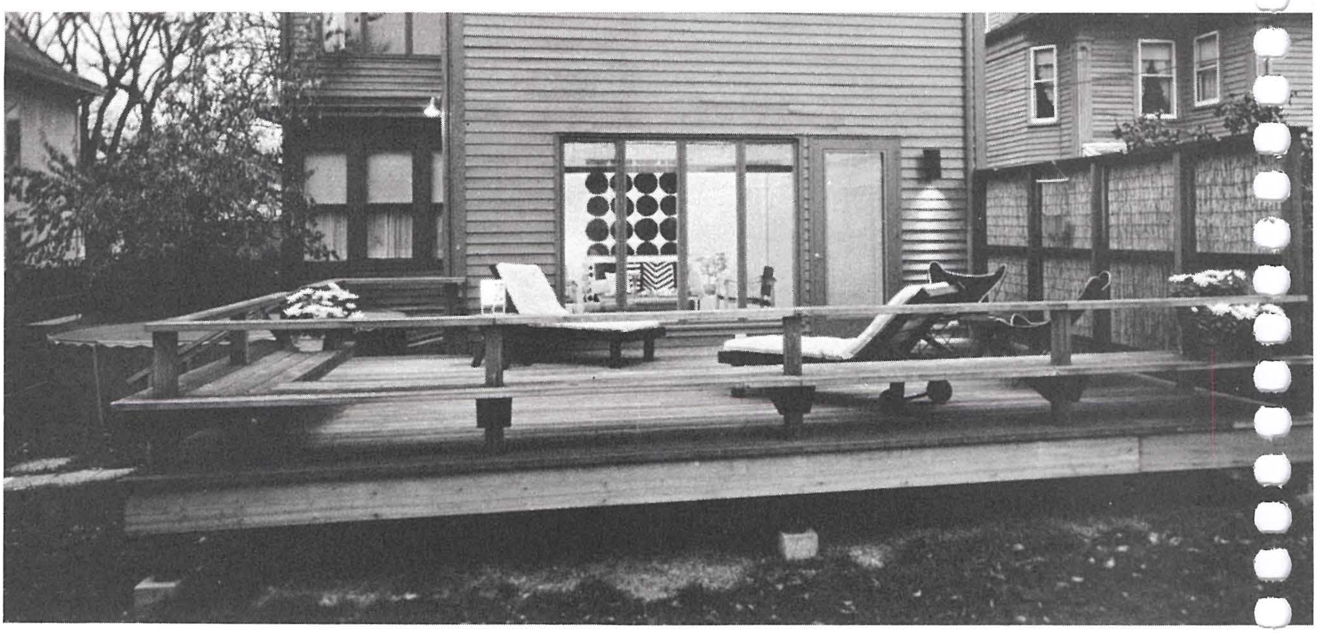
START LAYING BRICKS in the pattern of your choice. As you set each brick, tap it firmly with your hammer handle to "set" it level. After you have covered about 10 sq. ft., shovel on some mason's sand and brush it in place with a firm street broom to lock in the bricks. Repeat this step until all bricks are laid; then give the entire patio a thorough second sanding and brooming. Soak your patio for several hours with your lawn sprinkler. When it's fully dry, sand and broom it again to fill in voids, and repeat until no voids develop in the joints when the patio is soaked. When the patio is completely dry, clean it and, for aesthetic reasons, creosote the wood border. When using creosote, follow the instructions on the can and wear a long-sleeved shirt, gloves and goggles. Save some sand and bricks until your patio is fully weathered. Further sanding may be required and, quite likely, some split bricks will need replacing. You'll have these answers within two months of the day you completed your patio. If the weather does reveal some spots that need work, you should repair them in the same manner you laid the original work. Repeat the sweeping and filling until the repair is made.



OUTDOOR LIVING has become a way of life for the typical American family. Moderate seasons and temperate climates especially stimulate the desire for an "outdoor family room." The cost to build a deck is substantially lower than that of a same-size addition and, considering the use that the entire family will get from the new space. it's money well spent.

We've rounded up three particularly handsome decks—including the double-tiered variety for hilly sites (facing page) designed by Saint Paul, Minnesota, landscape architect Marion Fry. In addition, you'll find all the basics you need to

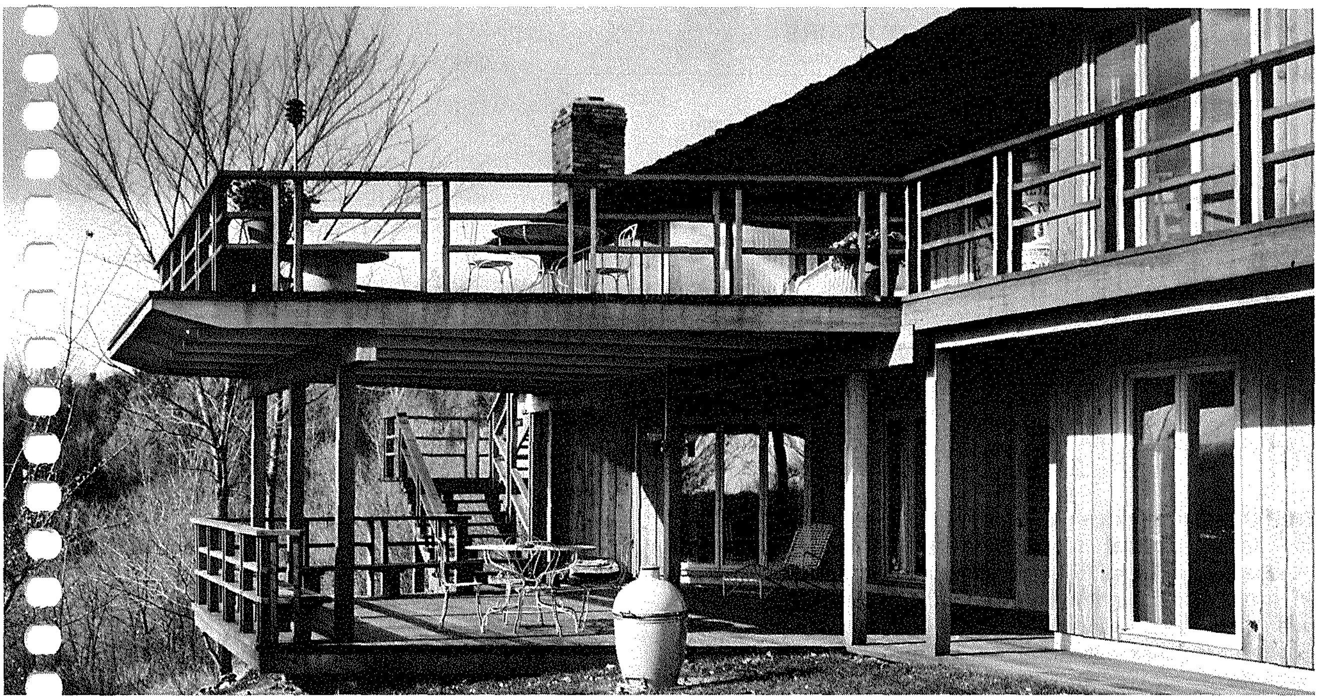
Deck and patio ideas you can borrow



DECKS ARE OFTEN the only means for outdoor living on steep building plots (top photo) and are popular for homes on level ground as well. The older home shown in the snapshot at the left was redesigned by architect Russell Zenk of Minneapolis. The house-coordinated deck plays an important role; it provides an adult entertainment center at night and a play area for the children by day.

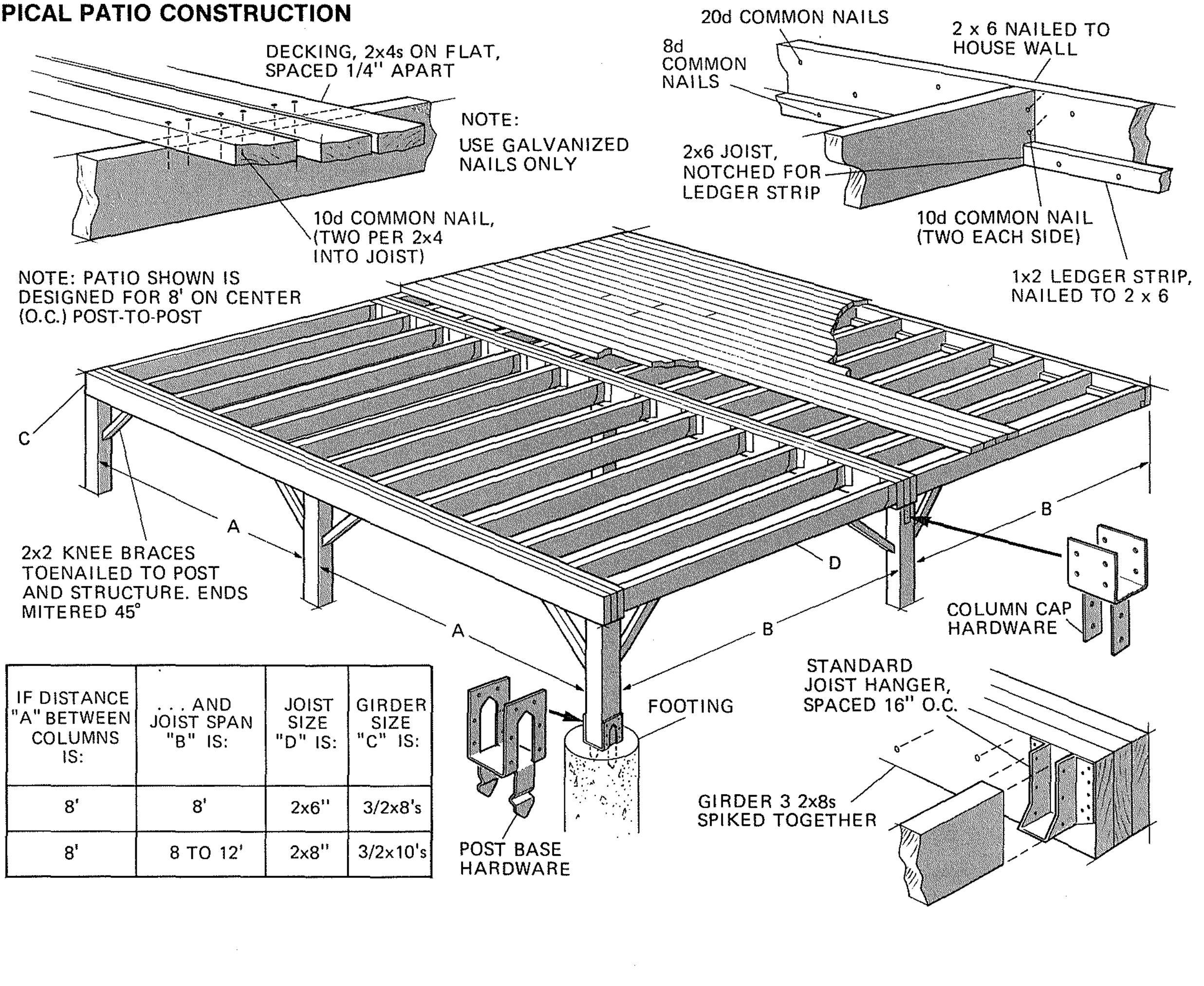
SEE ALSO

Barbecues . . . Benches, deck . . . Cabanas . . . Cookout bars . . . Decks . . . Firepits . . . Garden shelters . . . Gazebos . . . Lumber . . . Picnic tables . . . Planters . . . Stairs . . . Yard lighting



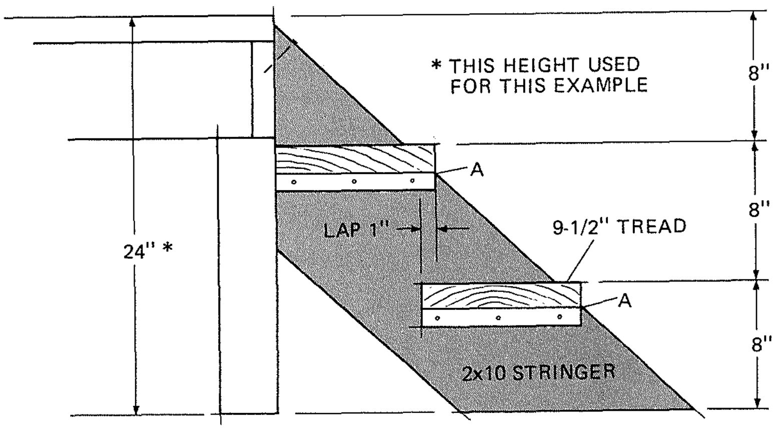
THIS HUGE double-tiered deck extends along the entire length of the house at the rear.

TYPICAL PATIO CONSTRUCTION

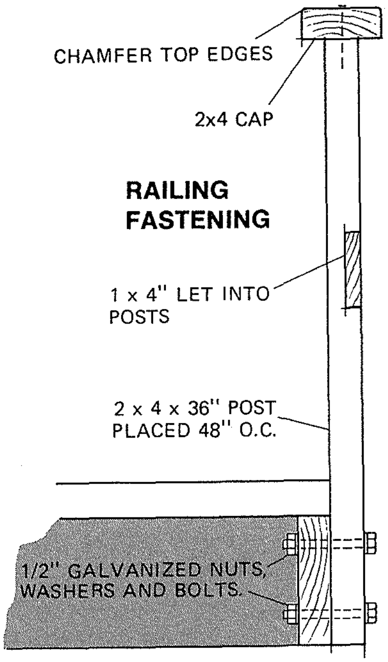

DECKING, 2x4s ON FLAT, SPACED 1/4" APART
NOTE: USE GALVANIZED NAILS ONLY
10d COMMON NAIL, (TWO PER 2x4 INTO JOIST)
20d COMMON NAILS
8d COMMON NAILS
2 x 6 NAILED TO HOUSE WALL
2x6 JOIST, NOTCHED FOR LEDGER STRIP
10d COMMON NAIL (TWO EACH SIDE)
1x2 LEDGER STRIP, NAILED TO 2 x 6
NOTE: PATIO SHOWN IS DESIGNED FOR 8' ON CENTER (O.C.) POST-TO-POST
C
A
A
B
B
D
2x2 KNEE BRACES TOENAILED TO POST AND STRUCTURE. ENDS MITERED 45°
COLUMN CAP HARDWARE
STANDARD JOIST HANGER, SPACED 16" O.C.
FOOTING
GIRDER 3 2x8s SPIKED TOGETHER
POST BASE HARDWARE

IF DISTANCE "A" BETWEEN COLUMNS IS:	. . . AND JOIST SPAN "B" IS:	JOIST SIZE "D" IS:	GIRDER SIZE "C" IS:
8'	8'	2x6"	3/2x8's
8'	8 TO 12'	2x8"	3/2x10's

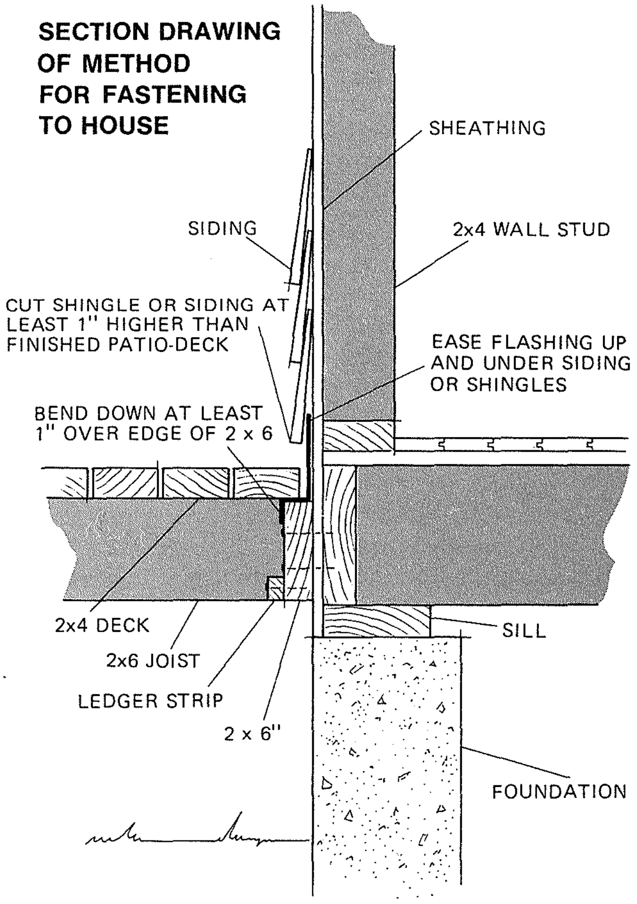
HOW TO LAY OUT STAIRS



STAIR DESIGN is tricky, but not beyond a do-it-yourselfer. The important point is that the riser height should never exceed 8½ in.—ideally, riser times tread (width) should equal 72. Thus, with an 8-in. rise, the tread should be 9 in. For best results, lay out the stairs actual-size on plywood or a clean garage floor. Measure the height from the deck to the ground and try a riser height of 8 in. A deck height of 24 in. divided by 8 equals three spaces. Since ground and deck are not counted, that means two treads will be required to make the 24-in. rise above.


CHAMFER TOP EDGES
2x4 CAP
RAILING FASTENING
1 x 4" LET INTO POSTS
2 x 4 x 36" POST PLACED 48" O.C.
1/2" GALVANIZED NUTS, WASHERS AND BOLTS

(USE 3-1/2" BOLTS TO FASTEN TO SINGLE JOIST, 9-1/2" BOLTS TO FASTEN TO GIRDER)


SECTION DRAWING OF METHOD FOR FASTENING TO HOUSE
SHEATHING
SIDING
2x4 WALL STUD
CUT SHINGLE OR SIDING AT LEAST 1" HIGHER THAN FINISHED PATIO-DECK
EASE FLASHING UP AND UNDER SIDING OR SHINGLES
BEND DOWN AT LEAST 1" OVER EDGE OF 2 x 6
2x4 DECK
SILL
2x6 JOIST
LEDGER STRIP
2 x 6"
FOUNDATION

* NOTE: FINISHED PATIO-DECK SHOULD BE LOWER THAN INTERIOR FLOOR

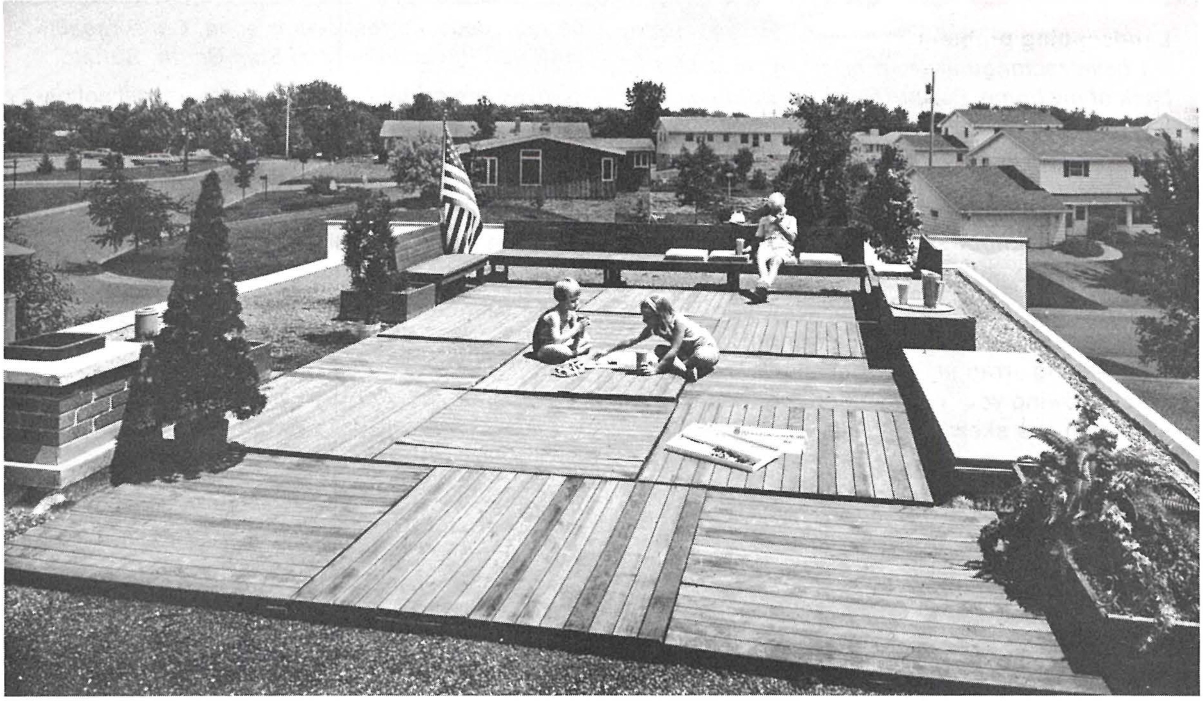
know for good deck construction shown in the drawings on these pages. Even if you decide to have a contractor build your deck, the information given in the drawings will let you determine whether the job is being done properly.

The type of materials you use is important. Usual decking requirements are wood that offers a high decay resistance, nonsplintering, good stiffness (for strength), wear resistance and minimal chance of warping. Woods with heartwood that combine these characteristics—from a good to a high degree—include: southern pine, cedar, redwood and cypress.

Open decking, as shown in the sketches, is usually nominal 2x4s spaced ¼ in. apart over joists. Here, because rainwater will run through the deck, good drainage below—away from the house—is a must. For a solid deck, which will be covered by outdoor carpet, use only exterior-grade plywood over the joists. Keep in mind that a solid deck must be pitched to provide positive water runoff. Flashing, installed as shown, is imperative.

Preservation treatment of wood decking is also important in extending the life of the deck. So, if possible, use wood that has been pressure-treated and, for longevity, treat your decks annually with preservative.

Local building codes vary on requirements for decks of this type.



Patio on the roof

By ANNETTE I. SUKOR

HERE'S ONE FAMILY'S SOLUTION to the problem of where to put the patio—it's on the roof!

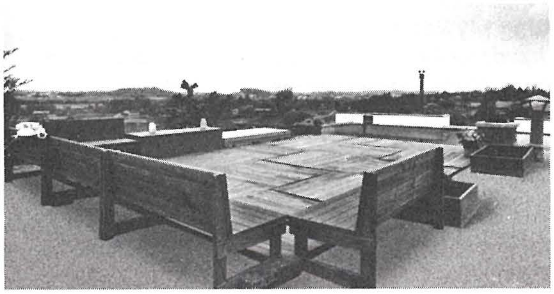
Complete with a roof garden, telephone and electrical outlets, and built-in benches of redwood, the patio has truly become an outdoor living center for the Ray Hedelson family of Edina, Minn.

Originally designed as a redwood deck to be used for sunbathing, the patio soon became a high-traffic relaxation and entertainment area for the entire family.

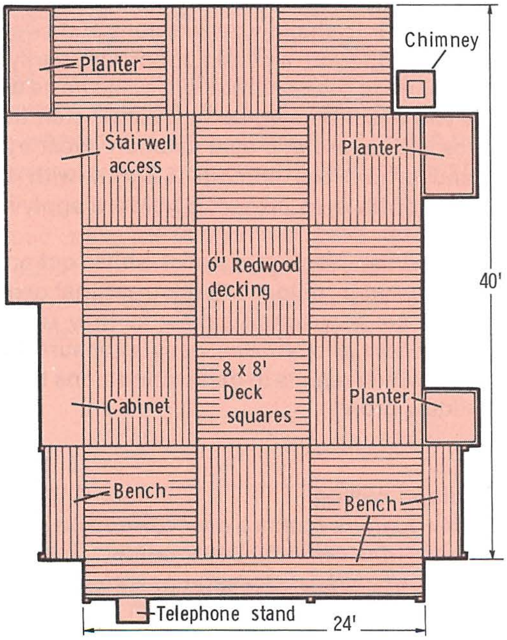
Though your roof-line may not permit building a patio atop your home, the handsome design could be used in your back yard or possibly atop an attached garage. Redwood decking 6 in. wide is used to form 8 x 8-ft. squares, like oversize parquet flooring. Similarly, you can borrow ideas on bench and cabinet construction from the photos and drawing.

SEE ALSO

Benches, deck . . . Decks . . . Gutters and downspouts . . . Planters . . . Roofs



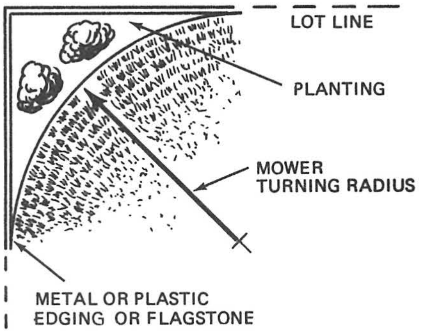
BENCHES FACE inboard to discourage children and visitors from venturing near the roof's edge.



Landscaping problem

I have rectangular lawn areas in front and in back of my home. I've purchased a riding mower and I have the problem of maneuvering to get those square corners. Can you suggest a simple landscaping that will eliminate, or at least reduce, the cramping and angling of the mower, so I can do the job without stopping?—Fred Ewell, Emporia, Kansas.

Although most of the newer mowers permit a fairly tight-radius turn when cornering, I've seen a landscaping arrangement that allows the kind of quick mowing you have in mind. This is done as shown in the sketch.



Floor holds water

My concrete patio floor has a low place that holds about ½ in. of water. The depression is 5 or 6 ft. in size, oval in shape. How can I correct his condition? Also, what makes a white shingle roof spot with brownish or black areas?—J.T. Ellis, Como, Mass.

There are concrete patchers that can be troweled into shallow depressions and swept to a feather edge with a whisk broom. Ordinarily these will bond to old concrete, but on so large an area as you describe I would first either etch the surface with a muriatic-acid solution (wear eye and hand protection) or chip it lightly with a cold chisel (with eyes protected) before applying the patchers.

Brownish-black areas on a white roof are usually caused by mildew. Large trees that overhang a roof are a common cause, as they reduce air circulation and shorten daily exposure to sunlight, which results in damp conditions that favor mildew growth.

Stained ceiling

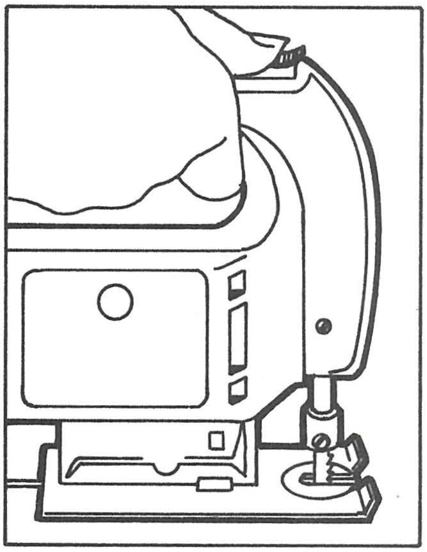
My upstairs bathtub overflowed and the water stained the ceiling plaster below. Only a small area of the affected plaster loosened and had to be replaced; the rest seems solid. Can I repaint and hide the stain?—Mrs. Stan Smith, Buffalo.

If you are certain that the plaster is still solidly anchored to the lath or mesh plaster base and that this plaster is thoroughly dry, you can give the area one coat of pigmented or white shellac and then repaint it. I'd wait at least two months from the date of the wetting before you repaint.

Clock running wild

What's wrong with an electric clock that gains as much as an hour or two in a day? It's a battery-driven type, and I was told that the battery should last a year. But I've only had the clock a few months.—Miles Osborne, San Francisco.

The battery is nearly exhausted. This type of clock will become inaccurate as the battery nears total failure. Most clock batteries will last a full year, but have a limited shelf life, and it's possible that yours was old and was not tested before it was placed in the clock. Install a fresh battery—have it tested—and then see how the clock runs. If it needs regulation, look for a tiny exposed screw on the back of the movement and adjust this screw until the clock keeps good time.

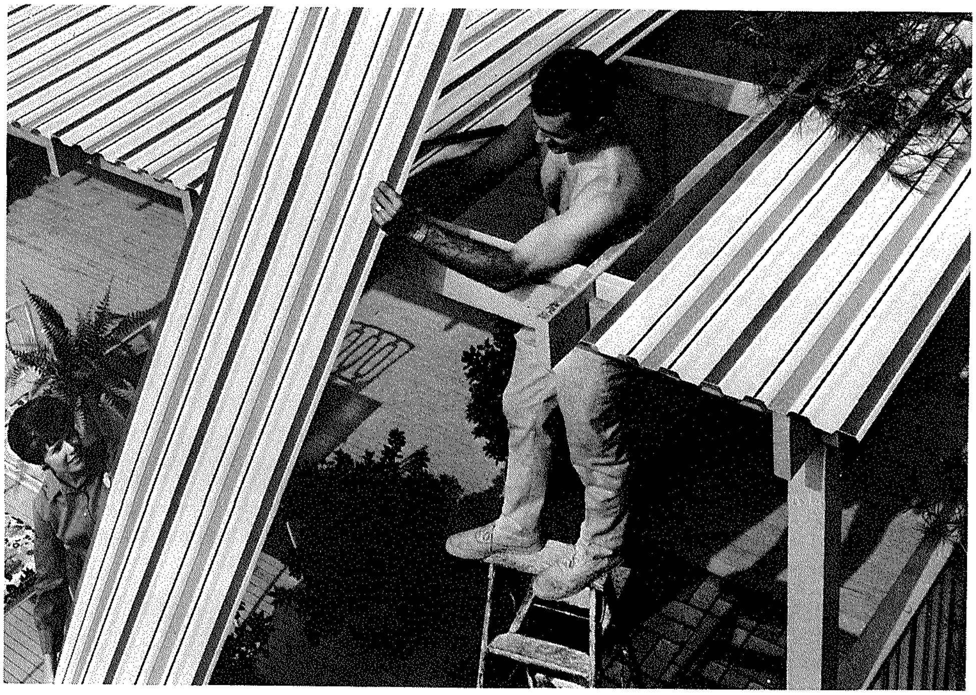


Cutting plywood

I have trouble cutting plywood with a sabre saw without chipping the edges, especially in ¼ and ½-in. thicknesses. I like neat workmanship. Can you guide me?—Donald Asp, La Puenta, Calif.

Use a fine-tooth (plywood) blade in the saw, and use a free-floating insert, as shown above, with it—get the one made for your saw. Keep the saw's shoe flat on the work and use a slow feeding pressure.

by W. Clyde Lammey



FIBERGLASS GETS stripes and a new angular rib for extra variety in applications.

Roof your patio with glass

By W. CLYDE LAMMEY

■ WHAT TO DO about that patio roof? A much-to-be-desired privacy fence? A room divider? Perhaps a hideaway for the garbage can? A backdrop for a flower planting or maybe an "eyebrow" awning over an exposed door?

Fiberglass panels can be the answer to the problems posed by these sample questions.

Fiberglass is a tough, colorful material, takes the weather without crumbling, peeling or flaking away. It lets in light, but you can't see through it; it filters infrared and lets ultra violet through. It sheds water like a duck's back, comes in rainbow colors and in big sheets that cover a lot of area in an hour or two of weekend time. You can drill the stuff, nail it, saw it, even bend it one way within reasonable limits.

The popular and perhaps the most useful pattern is a corrugated panel similar to metal corrugated roofing. This and other configurations such as flat sheets in plain colors or with embedded fibers in various designs in outline are available almost anywhere you might ask. Any of these can be framed into colorful fencings, room dividers, indoor planters, door panels and, well, you'll think of other uses, indoors and out.

Handling and working fiberglass panels calls for only a few minor precautions. You don't have to baby the stuff in the handling; you just avoid throwing it about or hitting it hard with a hammer. You don't drive nails through it without first drilling a nail-size hole. You stay at least ⅜ in. away from any edge of the panel with a drilled nail hole; better ½ in. or more if there's space. And you always use the approved nails and neoprene washers when attaching the panels to any framing. Of course, you can always use screws or even wood clips or other improvised fastenings, also the ready-cut moldings in structures where there is no undue stress on the panel. Otherwise you handle and work the material much as you would plywood.

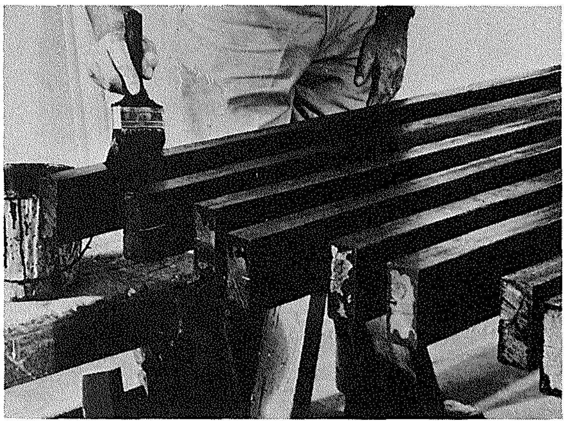
Your materials dealer will have work sheets and other data that will help you plan and install any form of fiberglass panel in any project in which the use of such panels is suitable.

continued →

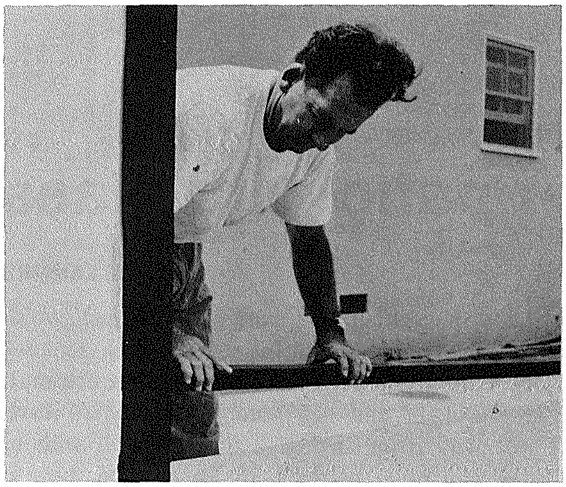
SEE ALSO

Barbecues . . . Benches, deck . . .
Carpeting, outdoor . . . Cookout bars . . . Decks . . .
Grill houses . . . Planters . . . Privacy screens . . . Roofs

roof your patio, continued

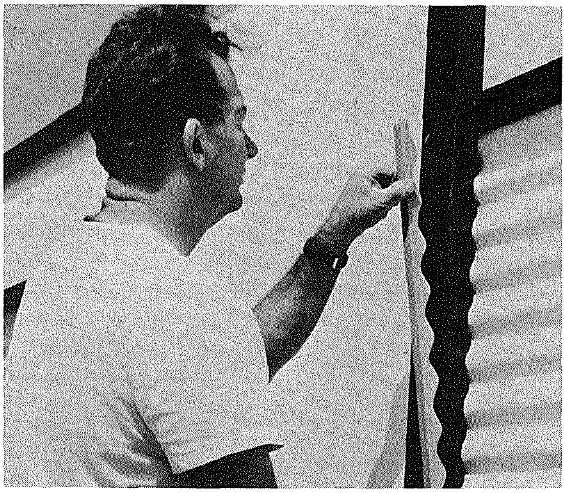


ALWAYS PAINT, stain (and rotproof) any lumber to be used out of doors with fiberglass paneling. The job will be neater, fiberglass free of drips and spatters.



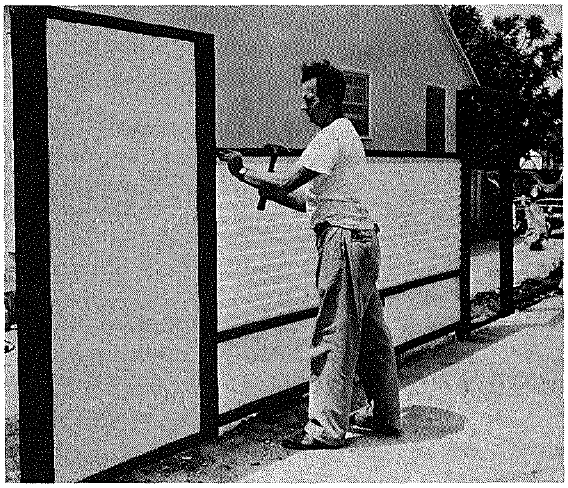
Photos courtesy Filon Division, Vistron Corp.

PRECUTTING grooves in framing posts and rails makes assembly run smoother. The rails can be toenailed or, better, notched into posts.

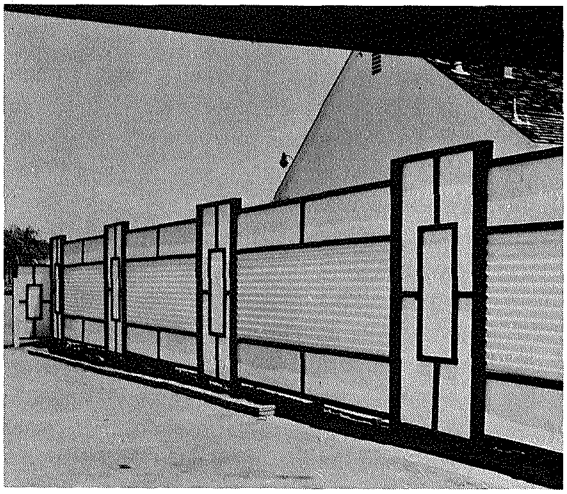


CORRUGATED panels in roofs, sidewalls or fences should be held in place with matching molding. It's available from the paneling dealer.

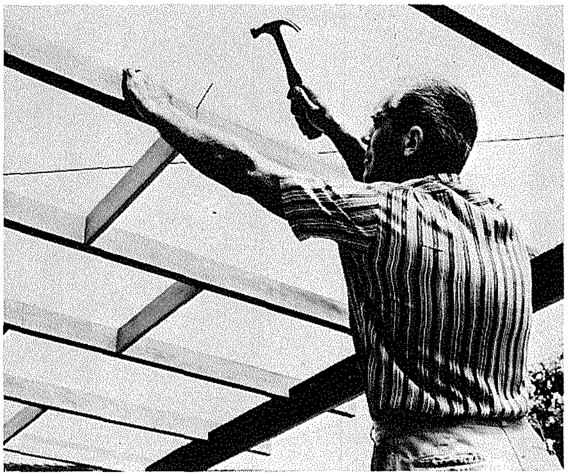
USE A LINE, level and spacer when placing vertical supports for fiberglass paneling. Careful accuracy is important, prevents trouble later on.



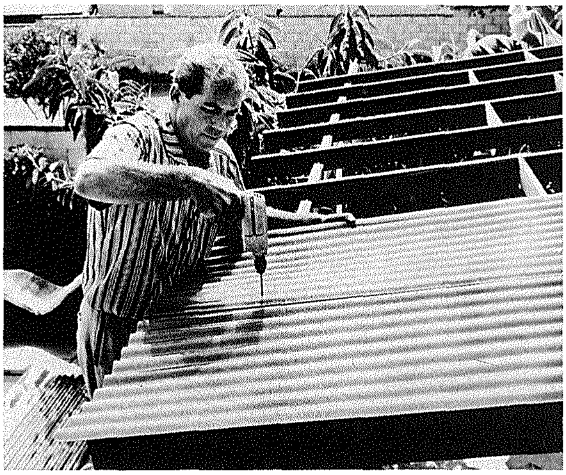
IF YOU DO toenail the rails, set nail heads below the surface and fill with putty. Corrugated panels can span greater distances unsupported.



A FENCE can present a handsome appearance plus light and color to those on either side. Such a structure also makes a good windbreak.

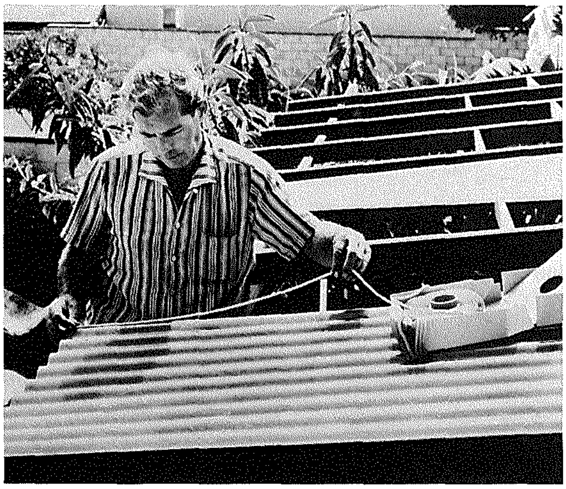


WHEN YOU nail through into end grain, be sure to aim the nail dead center for best holding power. Note the zigzag spacing of these center supports.

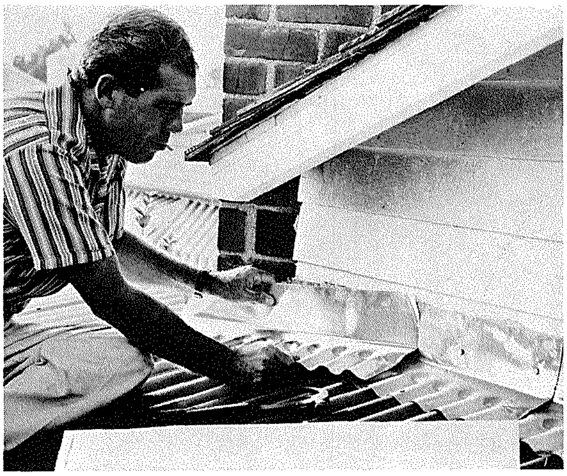


ALWAYS HEED manufacturers' specs for panel lap on roofs. Always drill the nail holes. And always use approved nails with neoprene washers.

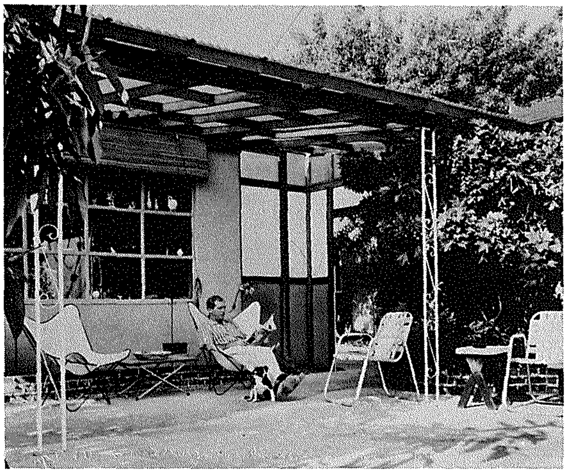
CAREFUL with that hammer! Fiberglass can stand almost anything but hammer blows; they can cause it to "craze" and eventually to break up around the nail.



SPECS usually call for weatherstripping the lap joints of roofing. It's easy to apply and prevents wind-driven rain from leaking between panels.



WHEN A patio roof joins siding, flashing is vital. Get the kind preformed to corrugations and ready to install for good waterproofing.



A SEGMENT of the out of doors becomes part of the house during the most enjoyable time of the year. You'll wonder how you got along without it.

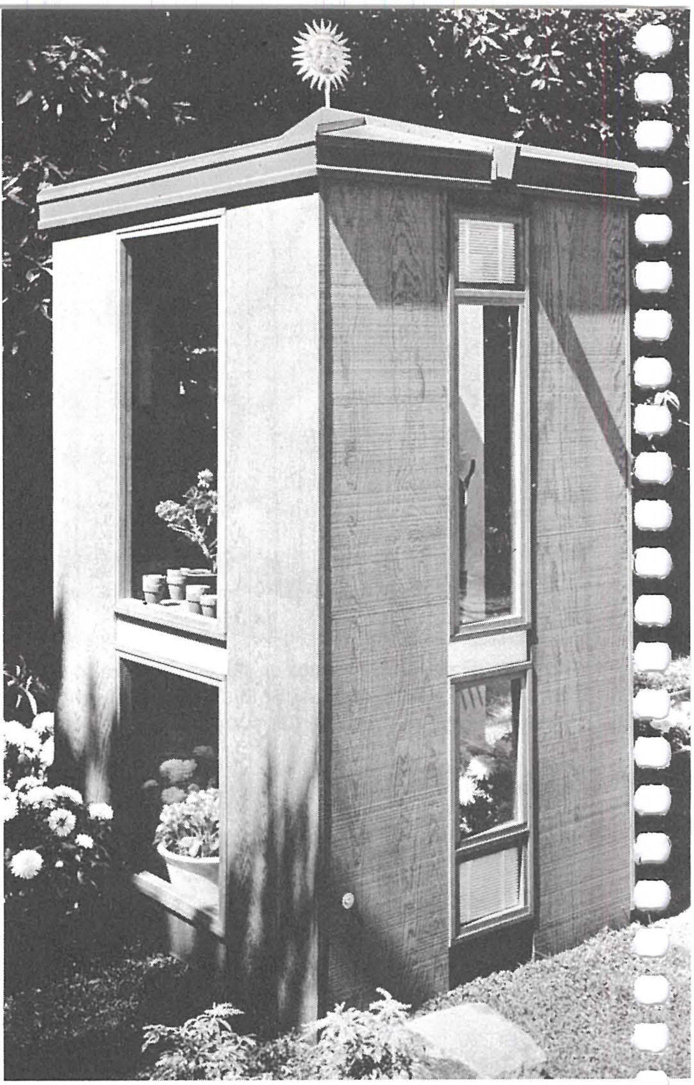
Patio partners you can make

Striking and easy to build, these structures add a special touch to your yard. All are weekend projects

By HARRY WICKS

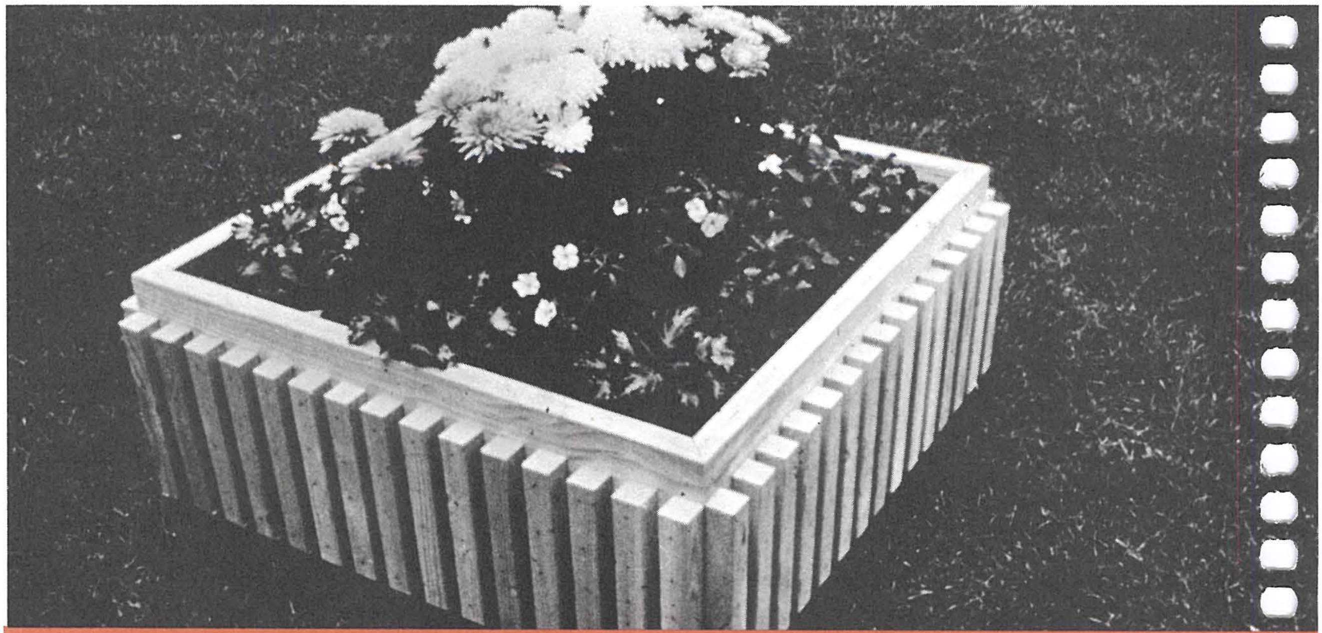
■ UPGRADING YOUR DECK, patio or back yard is a sure way to guarantee more enjoyable use of that space. To help provide ideas you can use, we've rounded up nine attractive projects that dress up any outdoor area.

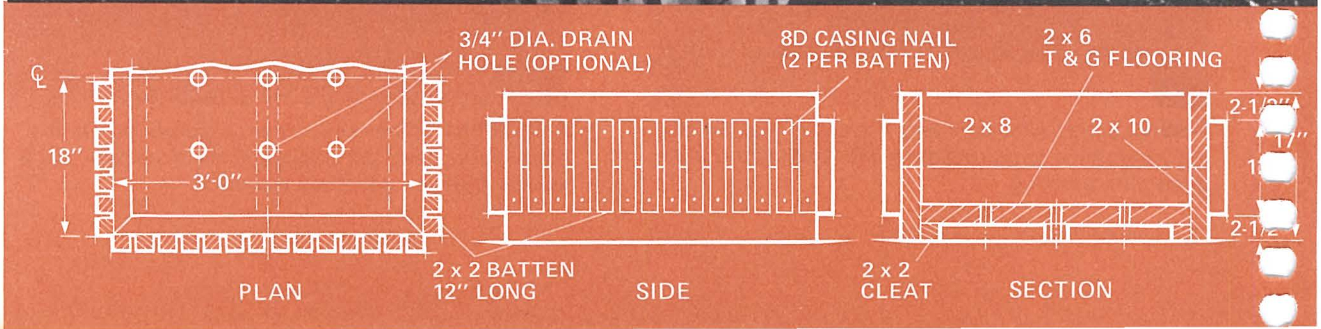
The usual woods used for outdoor construction include redwood, Douglas fir, ponderosa pine and Idaho white pine. Each has a color of its

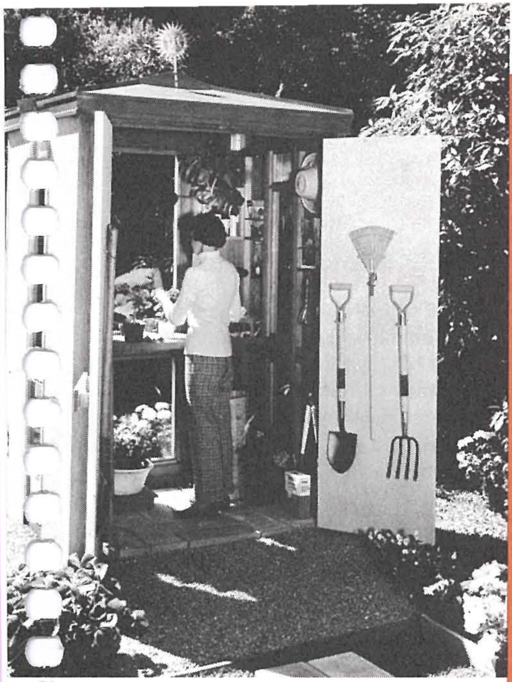


Planter

QUICKLY BUILT, this planter's bottom and sides can be of 1½-in.-thick (actual) tongue-and-groove construction lumber such as Douglas fir or ponderosa pine. Join parts as shown using 8 and 16d galvanized nails. Finish the planter with either latex or oil-based stain.

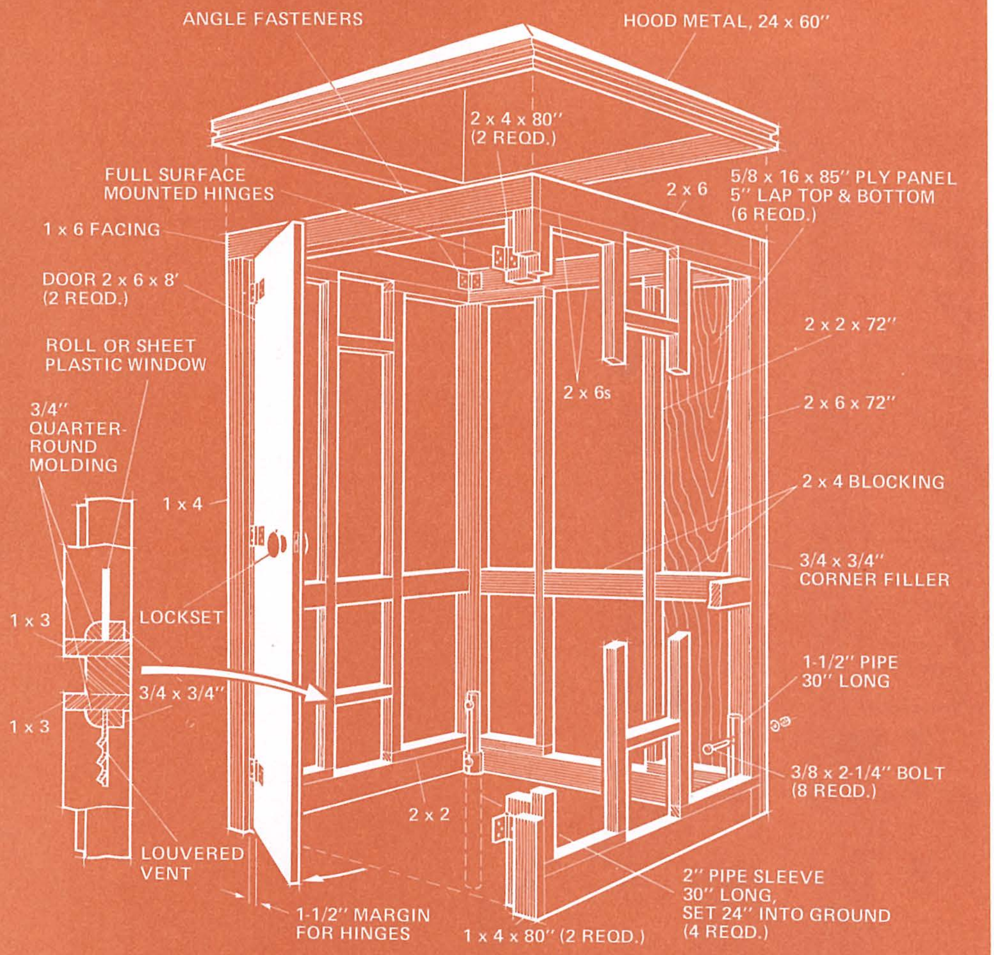




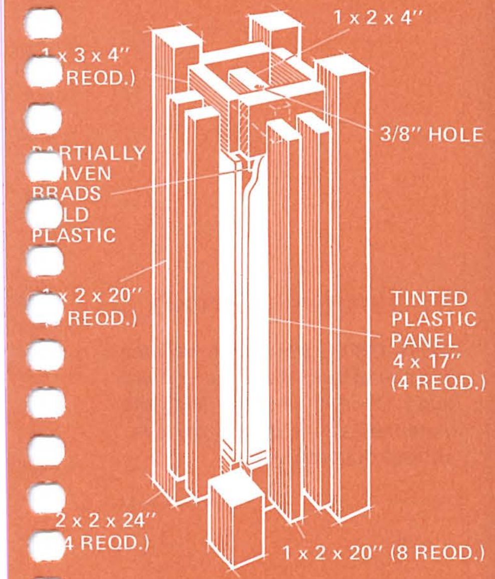


Storage gazebo

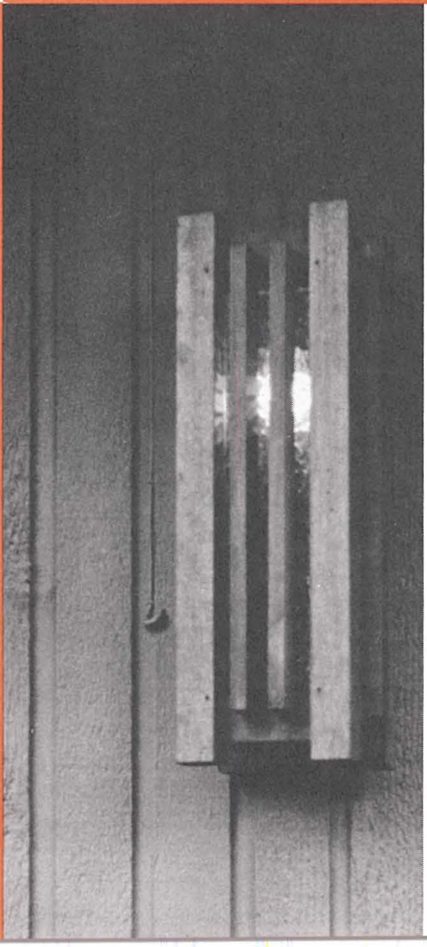
THE KEY to construction of this gazebo is the simplicity of the roof design—the joining of two metal hoods or awnings. Since the metal roof will dictate the gazebo's overall dimensions, have it fabricated at your local sheet-metal dealer and determine your building's size from it.



ANGLE FASTENERS
HOOD METAL, 24 x 60''
2 x 4 x 80'' (2 REQD.)
FULL SURFACE MOUNTED HINGES
2 x 6
5/8 x 16 x 85'' PLY PANEL 5'' LAP TOP & BOTTOM (6 REQD.)
1 x 6 FACING
DOOR 2 x 6 x 8' (2 REQD.)
ROLL OR SHEET PLASTIC WINDOW
2 x 2 x 72''
2 x 6s
2 x 6 x 72''
3/4'' QUARTER-ROUND MOLDING
1 x 4
2 x 4 BLOCKING
3/4 x 3/4'' CORNER FILLER
1 x 3
LOCKSET
1-1/2'' PIPE 30'' LONG
3/4 x 3/4''
1 x 3
3/8 x 2-1/4'' BOLT (8 REQD.)
2 x 2
LOUVERED VENT
2'' PIPE SLEEVE 30'' LONG, SET 24'' INTO GROUND (4 REQD.)
1-1/2'' MARGIN FOR HINGES
1 x 4 x 80'' (2 REQD.)



lectrical Materials: swag kit with chain; light socket; coupling, 1/8 in. dia.; hreaded tube or pipe, 1/8 in. dia.

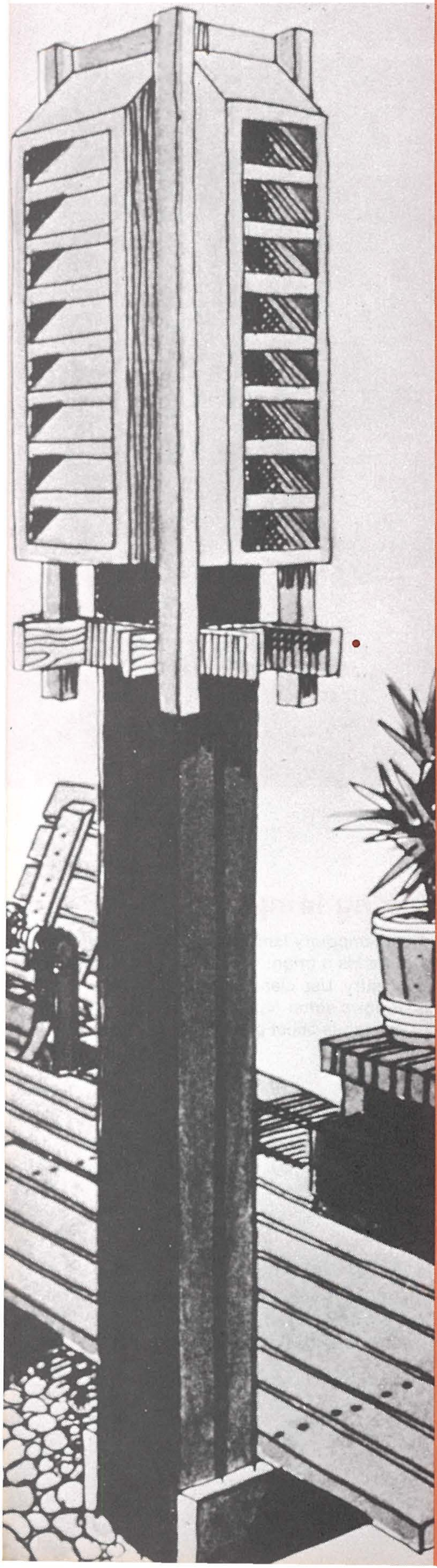


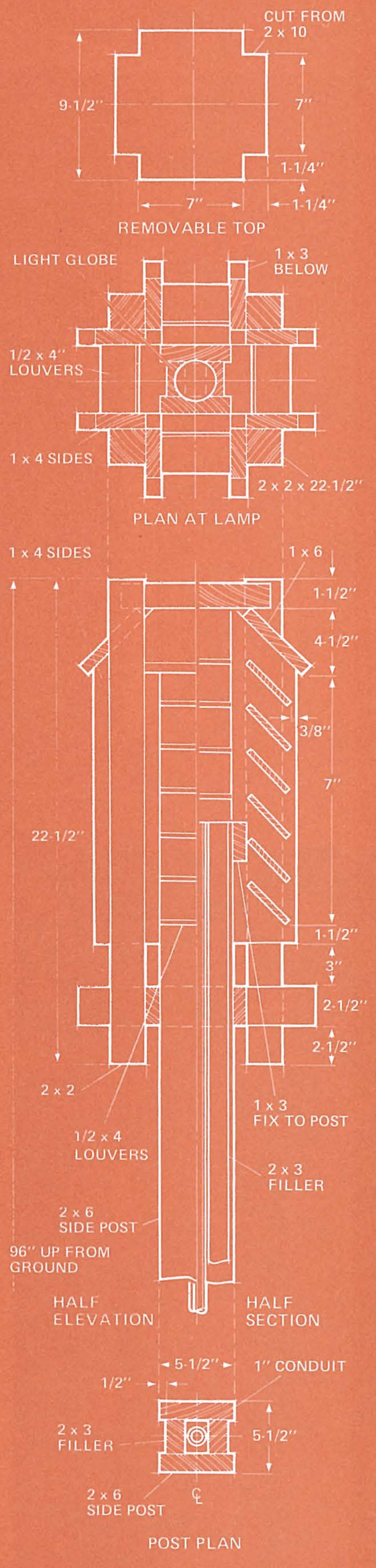
Hanging lamp

THIS contemporary lamp of redwood adds a bright note to a patio or entry. Use clear window glass or, for a softer light, frosted glass or opaque sheet plastic.

SEE ALSO

Barbecues . . . Benches, deck . . . Decks . . . Gazebos . . . Picnic tables . . . Planters . . . Post lamps . . . Privacy screens . . .





View divider

THE CLEAN LINES of this redwood fence make it adaptable to almost any back yard. The cutouts in the privacy screen serve a dual function—they let breezes pass and provide a place to display potted plants.

→

Post lamp

GOOD LIGHTING is essential for any deck. If the lamp is entirely of wood, it's sure to go with any outdoor decor. Simply stain the wood to blend with the patio.

←

Grille fence

THE GEOMETRIC pattern created by the latticework is pleasing to look at but doesn't block airflow.

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Redwood planter

SIMPLICITY is the design key here. One pair of box sides is framed with heavy 1½-in.-thick stiles and rails, while the second pair of sides is without decoration.

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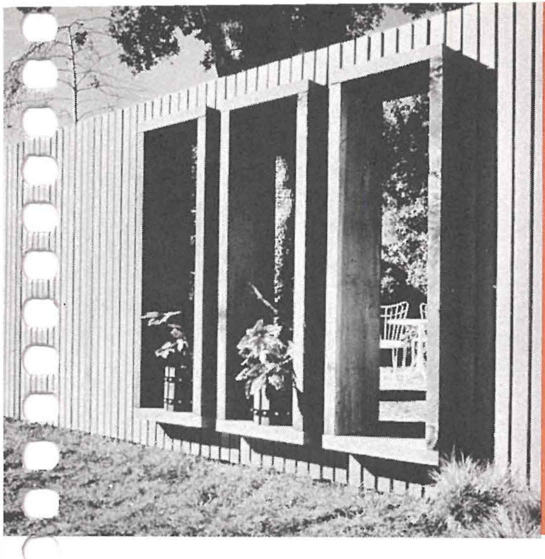
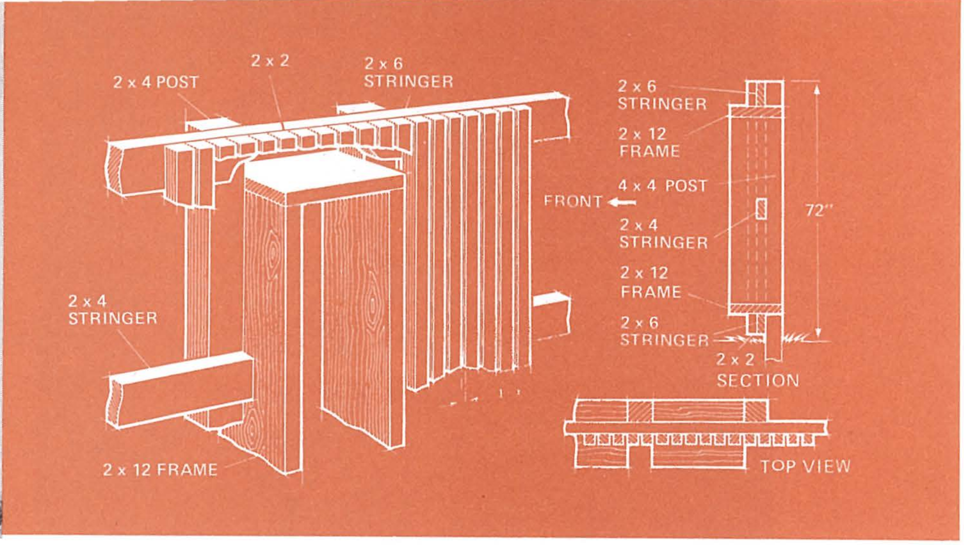
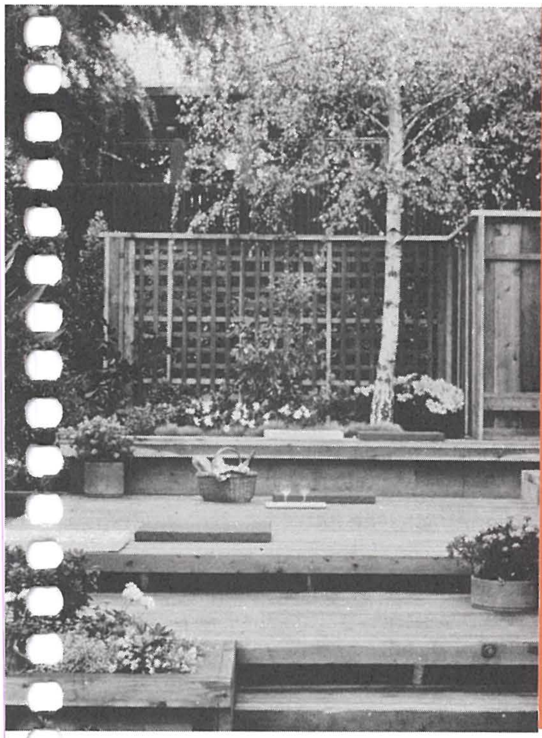
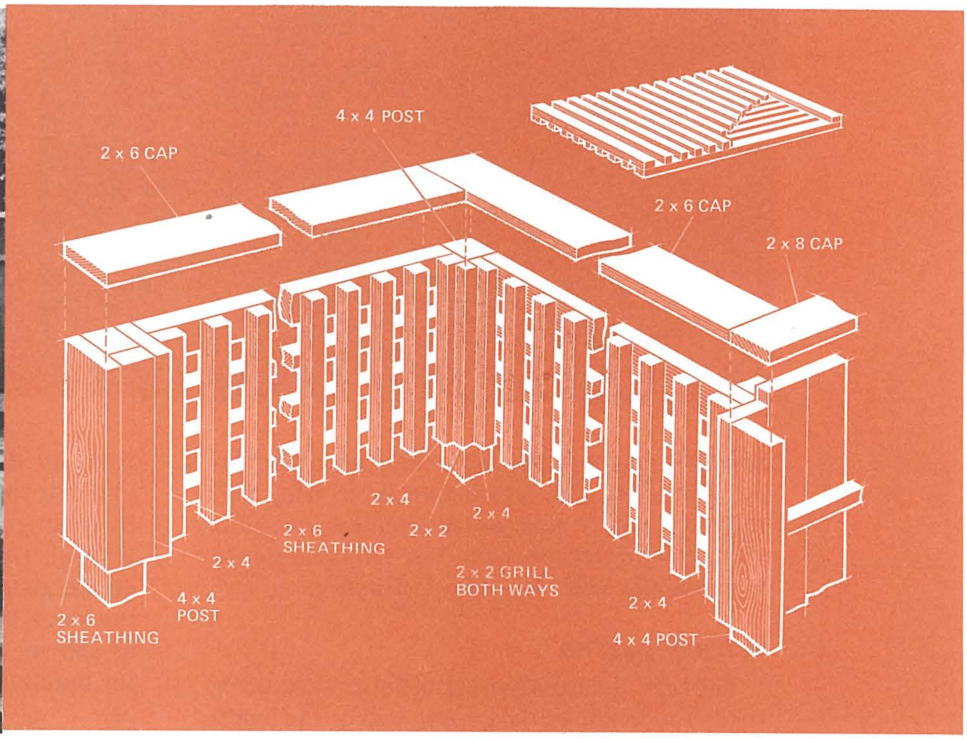
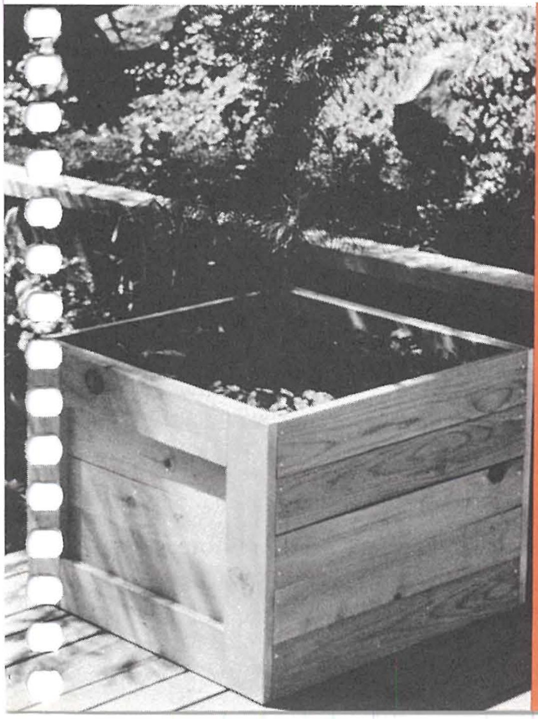
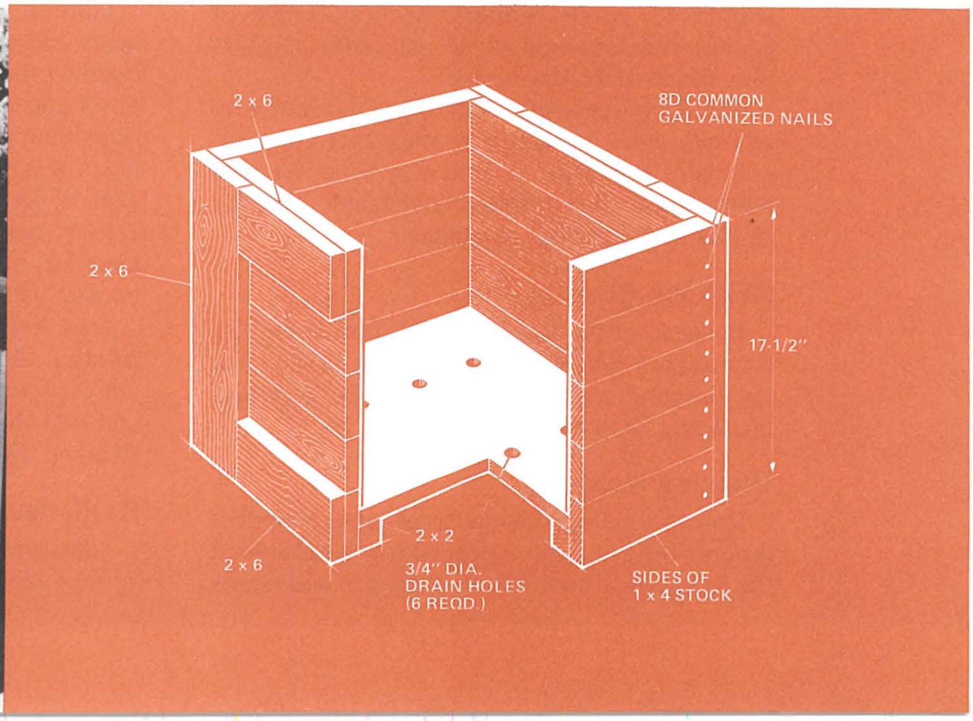


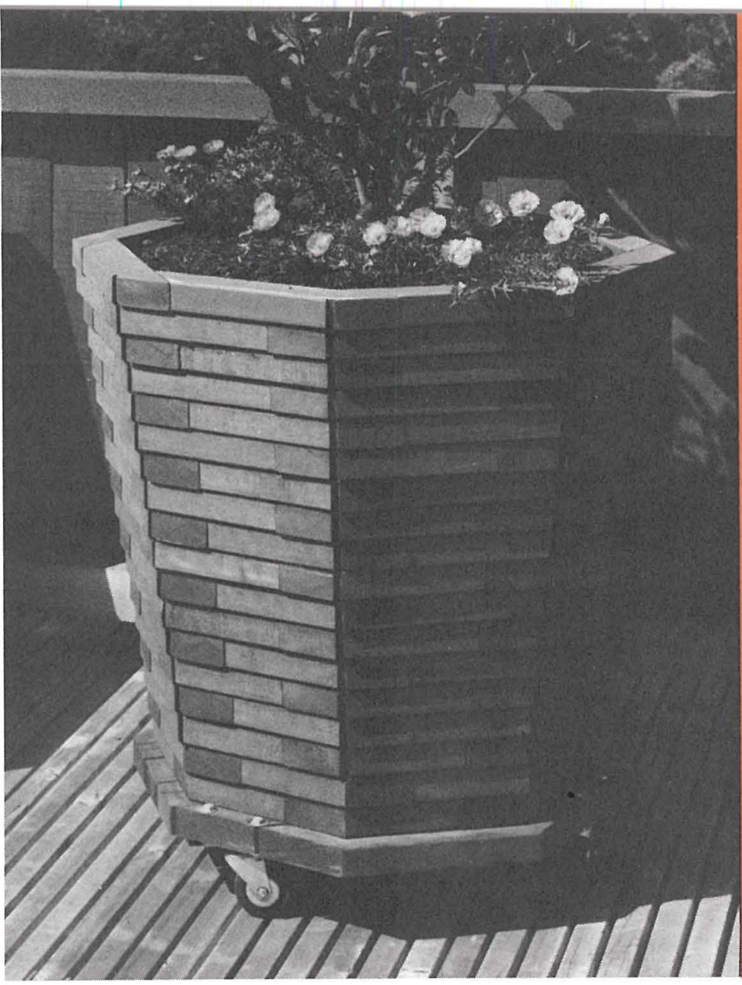

2 x 4 POST
2 x 2
2 x 6 STRINGER
2 x 6 STRINGER
2 x 12 FRAME
4 x 4 POST
FRONT
2 x 4 STRINGER
72''
2 x 12 FRAME
2 x 6 STRINGER
2 x 2
SECTION
2 x 4 STRINGER
TOP VIEW
2 x 12 FRAME

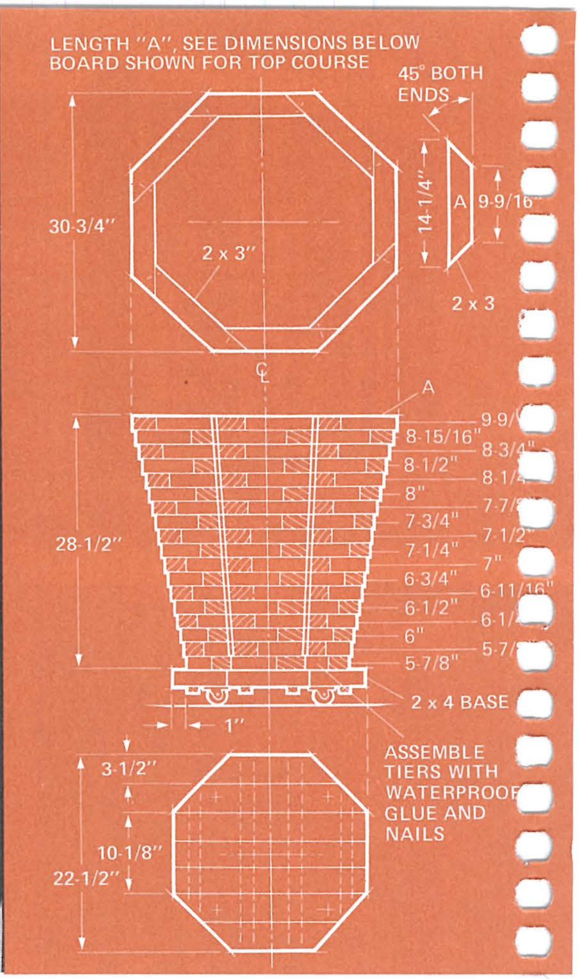



4 x 4 POST
2 x 6 CAP
2 x 6 CAP
2 x 8 CAP
2 x 4
2 x 4
2 x 2
2 x 6 SHEATHING
2 x 4
4 x 4 POST
2 x 6 SHEATHING
2 x 2 GRILL BOTH WAYS
2 x 4
4 x 4 POST




2 x 6
8D COMMON GALVANIZED NAILS
2 x 6
17-1/2''
2 x 2
2 x 6
3/4'' DIA. DRAIN HOLES (6 REQD.)
SIDES OF 1 x 4 STOCK





own and this, probably more than any other factor, will determine which lumber to use. You might well apply stain or treat outdoor projects with a clear water repellent. Use only galvanized or aluminum nails for all construction.

Storage gazebo

The roof dictates the overall dimensions of the shed. The length of the gazebo will be the length of the hood minus material thickness, while width is double the awning projection. Height, of course, is determined by the pair of 80-in. doors plus the door header above.

The least expensive way to get the roof is to join two metal hoods or awnings that are commercially available, or you can have the roof fabricated at a local sheet-metal dealer using the photos and drawings as guides.

Redwood planter

Because of its large size, this box is built of tongue-and-groove stock. Assemble as shown in the drawing using galvanized nails; weatherproof glue is optional.

Hanging lamp

Constructed of redwood, this lamp is perfect for entryway or patio. Set plastic or glass behind the 1x2 verticals and fasten the panes with brads partially driven into the horizontal members (1x3s) at top and bottom. Attach the 2x2 corners by drilling and nailing to the horizontal members as well. Drill a hole in the spacer block to accommodate the electrical threaded tube, and nail the block in place. Install electrical components as shown, and finish with clear sealer intended for outdoor use.

View divider

Garden grades of redwood—construction heart and construction common—are ideal for building this privacy screen. Use the former for posts and bottom stringer and the latter for all remaining parts. Posts are set at 4-ft. intervals; posts also flank each window. Since the width of each window is 15½ in., set the flanking posts 15½ in. apart or 19 in. on center. Plant posts at least 2 ft. in ground (or below area frost line) and anchor them in concrete.

Nail top and bottom stringers to posts and position the 2x4 stringer midway between. Finally, predrill holes in the 2x2 vertical members and nail them to stringers using a nail at each stringer. Fasten all members with 16d nails.

Grille fence

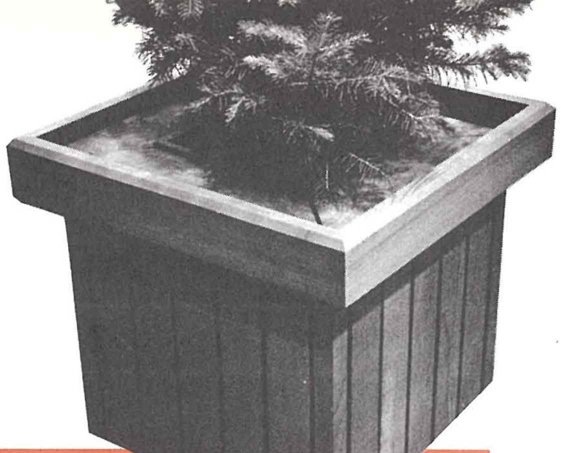
Construction is similar to the previously described fence. Open latticework is spotted here

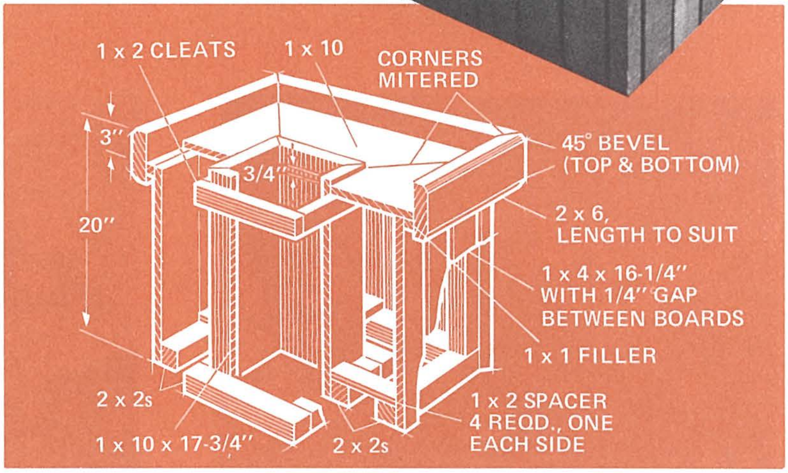
Octagon planter

It can be built of western red cedar for less than \$50. The planter shown has a 30½-in. dia. at the top and stands about 32 in. high on casters. The 18 courses that form the sides are 2x3 (nominal lumber). Note dimension "A" for each course: This is the inside measurement as shown. The easiest way to assemble the planter is to work upside down, starting with the top course and proceeding downward

Stained planter

Well suited for holding shrubs or plants, this box has sides capped by 2x6s. The outside edges of the 2x6s are chamfered for a pleasing effect





and there in a closed fence to guarantee passage of cooling breezes. Build the lattice section as shown in the drawing on page 2265.

Post lamp

This design is particularly well suited for construction with clear Idaho pine followed by a stain to suit patio or entry decor. Construction of the lamp is easier than it may appear. Start by marking and nailing louvers and top pieces to the sides to create four units. After adding the 1x1 filler strips to inside edges of two of the louver units, secure units together by nailing through the filler strips. Next, toenail the four lengths of 2x2s into the four corners formed by the louver units. Fabricate the post, install in ground and slip in lamp. Collar of 1x3s at top of post and 1x3 strips below hold lamp assembly in place.

Redwood planter

This is basically a simple box. Complete plans for building it are shown on page 2265. Notice that the box design includes two different pairs of sides. Construction of redwood planters requires two basic precautions to make them maintenance-free. First, be sure to drill holes in, or leave narrow spaces between, bottom boards to assure adequate drainage. Second, use only corrosion-resistant nails and fasteners.

Octagonal planter

The 18 courses that form the sides of this planter are cut from nominal 2x3 cedar lumber. Measurements are easy—see the example of one length (A) shown for the top course. Measurements in the drawing are for the dimension shown in the example—that is, the short length between the 45° miter cuts at both ends.

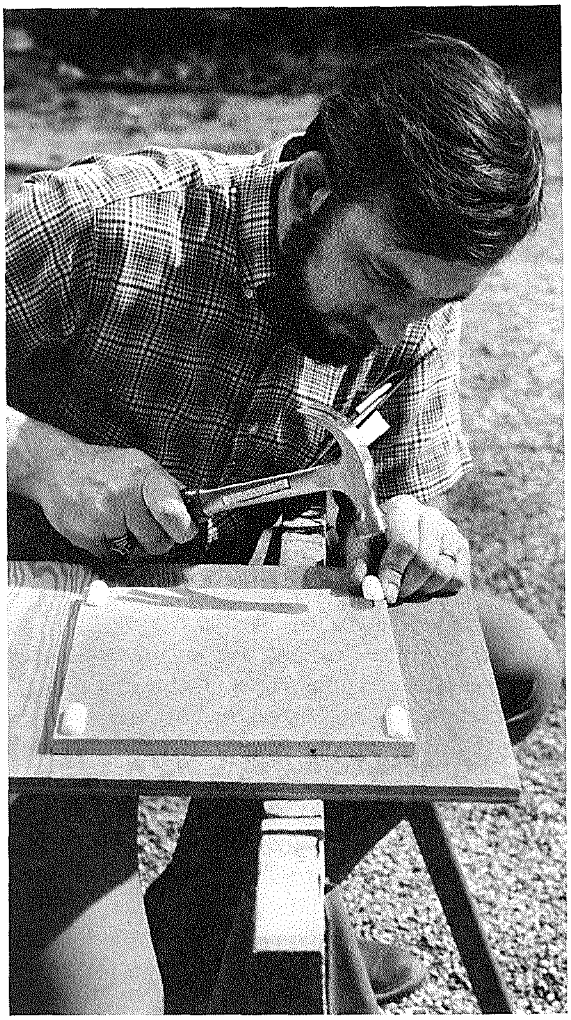
To build the planter shown, you'll need 144 linear feet of lumber for the sides. Two galvanized 12d nails in each piece hold it firmly to the piece under it. Though it's optional, it would be wise to use waterproof glue. Vertical grooves at corners help to hide uneven cuts. Making them requires careful use of a portable circular saw and a tacked-on guide. Painting is not advised for this planter; rather, stain it to match house or patio. For simplicity, assemble pieces with planter upside down.

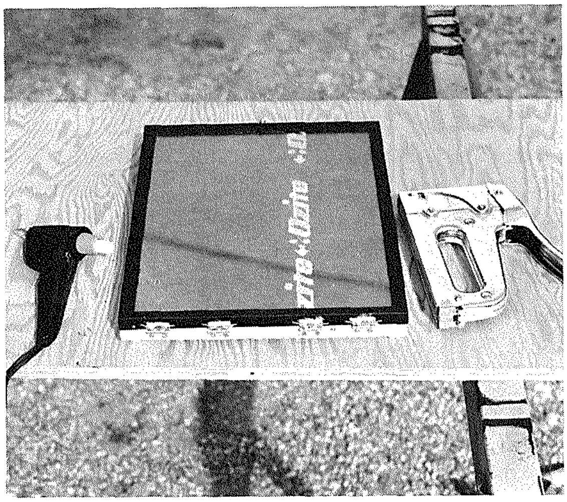
Stained planter

Basically a box, this planter can be made of either construction grade (knotty) or clear pine. As seen in the construction drawing, a second box is created on the inside to receive the plant container. This box, of course, can be sized to suit the plant of your choice. If desired, a shelf can be added here to raise the pot height.

Hints for photographers

Many and ingenious are the ways photographers have found to ease their tasks, become more versatile, and beat the high cost of photographic equipment—often by building their own



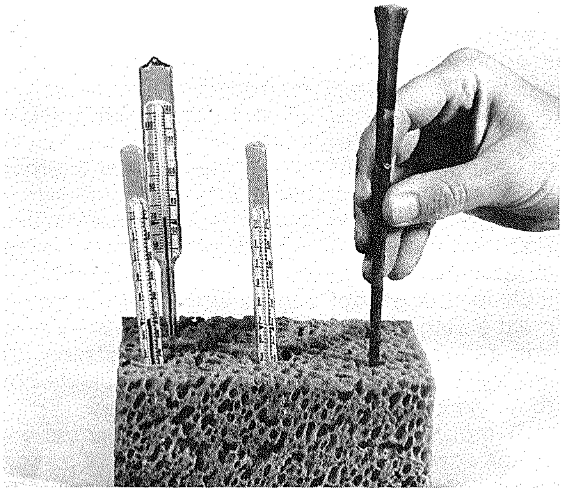


A PICTURE FRAME makes a low-cost photo proofer: The quickest, easiest way to evaluate your shooting is by contact-printing a proof sheet for each roll you shoot. But commercial proofing easels cost $10 or more, and the cheapest, simplest alternative—a sheet of plate glass—is likely to collect finger-prints, or slip out of your hands and shatter on the floor.

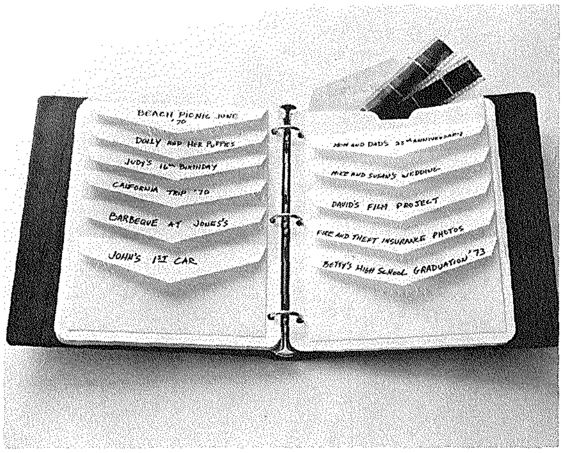
But you can build your own proofer for under $3. Materials are just a 9x12 picture frame with glass, a piece of ½-inch plywood cut to the frame's outside dimensions, a 12-inch square of indoor-outdoor carpet, plus hinges and tack bumpers.

To start, remove the small nails or wires which hold the glass in the frame and take out the glass. Then line the frame's inside rim with glue, replace the glass and weight it with a heavy book till dry.

While that's drying, paint the bottom and edges of the plywood (but not the top), and put a tack bumper on each corner of the bottom. When the paint dries, place the frame on the base and secure the hinges. Then glue the carpet square—face down and foam backing up—to the plywood base. Trim away the excess. A bulletin-board pushpin in the frame side opposite the hinge makes a good lifting handle.



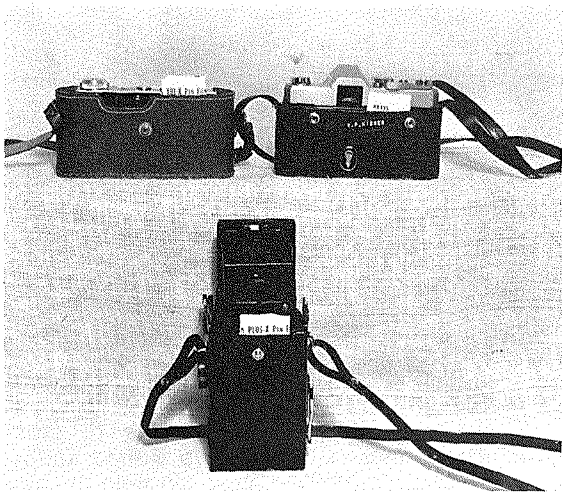
SPONGE HOLDS DARKROOM THERMOMETERS: Need a safe, convenient place to hold your darkroom thermometers? Cut holes in a large plastic sponge, using a sharpened piece of quarter-inch copper tubing as a cutter. The holes in the low-cost "rack" will hold the thermometers and stirring rods conveniently—and you can still use the sponge for wiping up darkroom spills.



HERE'S AN EASY WAY TO FILE your negatives where you can find them again. Glue No. 6-¾ (3-⅝ x 6½ in.) envelopes to loose-leaf notebook pages, four or five to each side of the paper, overlapping them so that only the flaps are visible. Identify the negatives in each envelope by writing the subject name or film number on the flaps. Then file in a ring binder. If you have a lot of negatives, you can restrict each page to negative subjects starting with the same letter, then file them between alphabetical index separator pages.

SEE ALSO

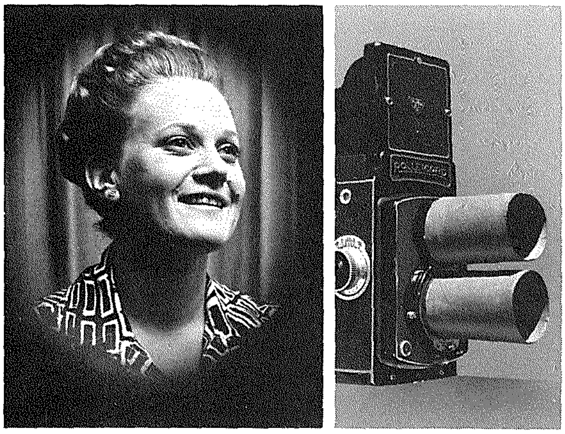
Camera bags . . . Cameras, care . . .
Close-up photos . . . Darkrooms . . .
Developing, photo . . . Dryers, photo . . .
Enlarging, photo . . . Lenses, photo . . . Monopods . . .
Photography . . . Prints, photo

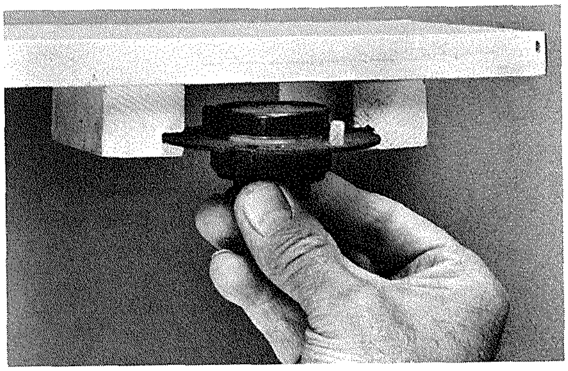


DATA SHEET A HANDY FILM REMINDER: You won't forget what's in your camera if you fold the film's data sheet and tuck it into your camera case with the film's name showing. What's more, that leaves the data sheet right there when you want it for checking exposure, filter factors or anything else you may suddenly want to know about before you push the button.

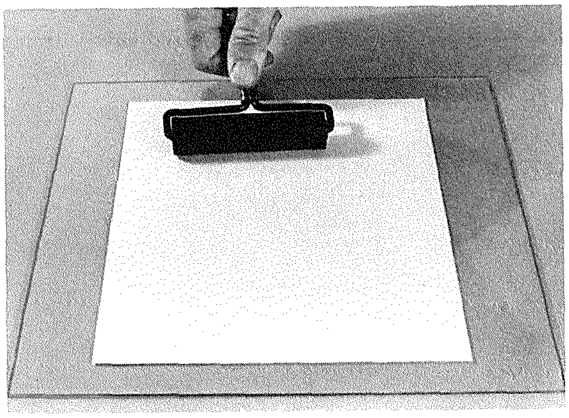
continued

A SIMPLE EFFECTIVE VIGNETTER may be made by cutting a toilet paper roll in two, painting its interior flat black, and carefully slipping it over the lens (or into a filter adapter ring) of a reflex camera. For a twin-lens reflex, use two identical vignetters. To vary the effect, change tube lengths: a longer tube will vignette more, a shorter one will vignette less.

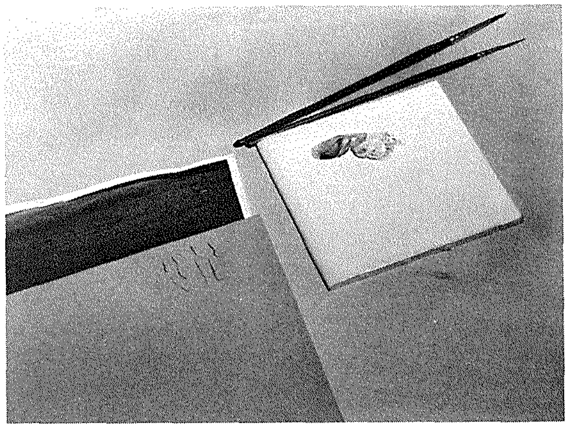




ENLARGING LENS SLIPS under shelf: If you use more than one size of film, you'll need more than one enlarging lens—and a place to store whichever lens isn't in use. Two slotted lumber scraps under a darkroom shelf will hold the lens handily, complete with lens board. The shelf will help keep dust off the lens, but if you have lens caps, use them.

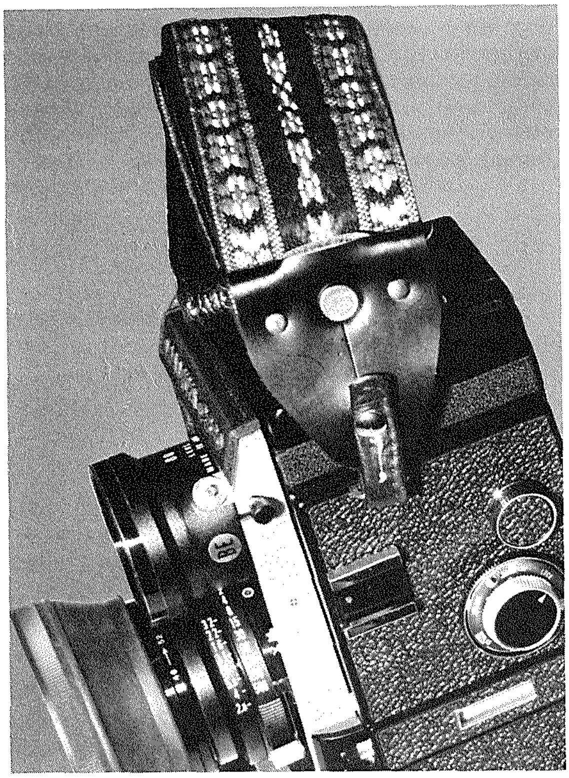


PLASTIC "FERROTYPE" FOR COLOR PRINTS: Do your ferrotyped color prints have measles? Those stains are due to pits and scratches in the ferrotype plate's surface. For foolproof color ferrotyping, cut a new plate from clear plastic "window glass," sold by builders' supply stores. In hot or dry weather, cover the prints with old newspapers once they're on the plate, so drying will be slow and even.

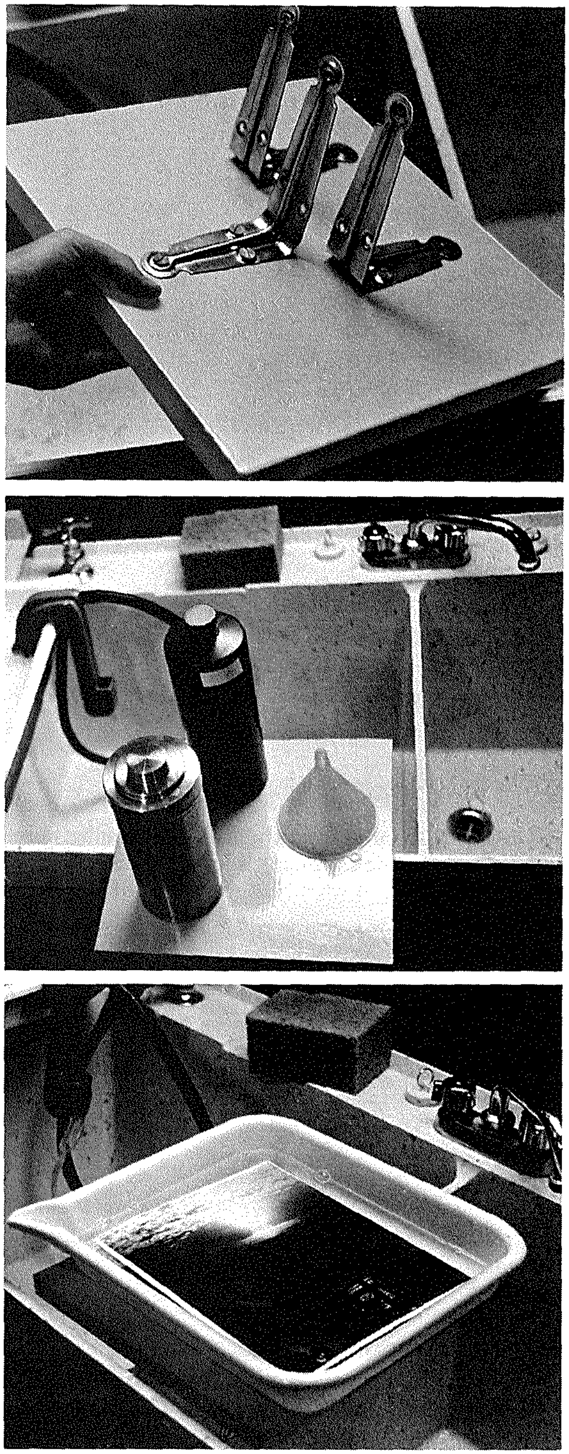


GUITAR STRAP EASES CAMERA LOAD: Ever need relief after carrying a camera and gadget bag around through a full day's shooting? Most weekend photographers overload themselves with gear, then suffer aches and pains from muscles they don't use during the week unless they're postmen. A touch of arthritis made one shutterbug look for something easier on his shoulders than the narrow straps and pads now sold for photo use. He found the answer in colorful, extra-wide guitar straps—two-inch straps for his camera and three-inch for his gadget bag—distributing the equipment's weight over the largest possible body area, and relieving muscular strain. The straps are strong enough to carry your equipment safely, and they can cost less than a good strap pad.

To mount them, cut your camera and gadget-bag straps down to three-inch stubs, and have a shoe-repair shop stub-rivet the stubs to the guitar strap's leather tab end.

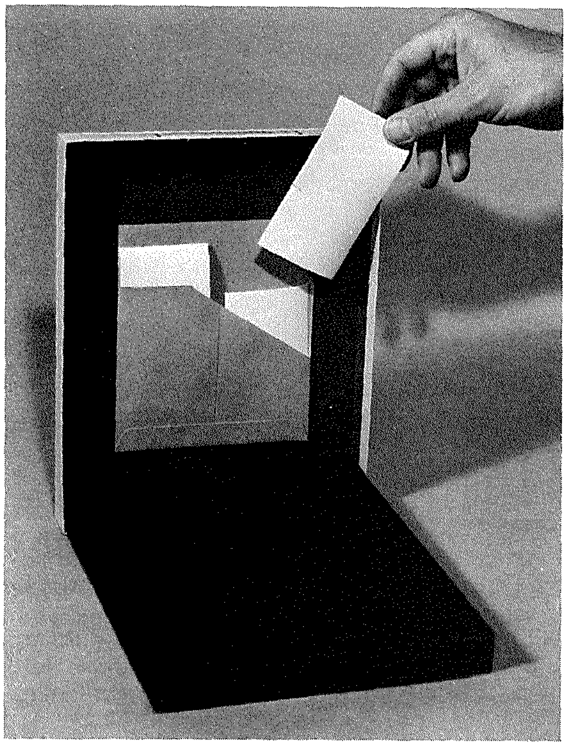


AIDS TO EASIER PRINT-SPOTTING: Print-spotting gets a lot less tedious if you work on only one section of a print at a time, blocking off the rest of the area with a sheet of white or yellow construction paper. This paper also doubles as a blotter for removing excess spotting fluid from your brush. And a plain, white, 4-inch-square tile from the hardware store is great for mixing the spotting dyes.



DARKROOM SHELF FITS ON LAUNDRY TUB: If you're using a laundry tub, either single or double, for a darkroom sink, here's a shelf that will stretch your effective counter area—and will drain off easily into the tub.

Attach three 5-inch shelf brackets to a suitable piece of scrap lumber, as shown, so the brackets will fit snugly over the side or divider of the tub. A coat of epoxy paint will make it waterproof and stain-resistant. It's handy for holding trays or developing tanks, and for mixing chemicals.



ENVELOPE KEEPS TEST STRIPS HANDY: Photographic test strips left lying loose in your enlarging paper box can be hard to find in the dark. Keep them in a manilla envelope, cut open as shown above, and glued to the inside of the enlarging paper box lid.

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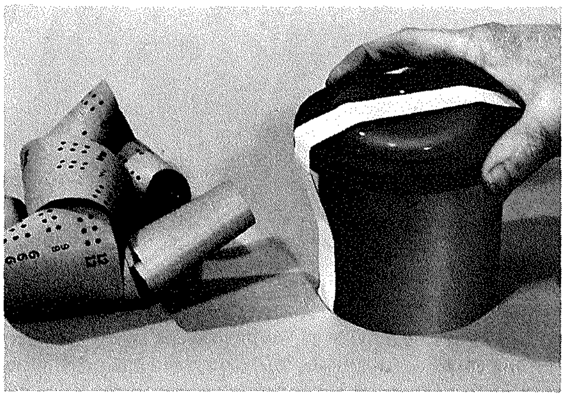
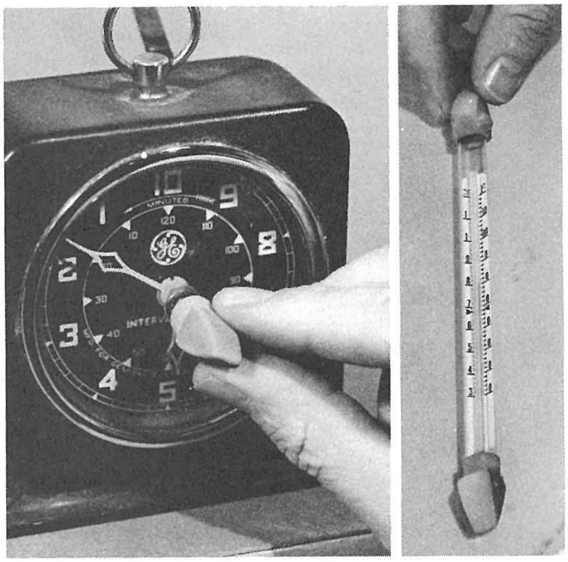
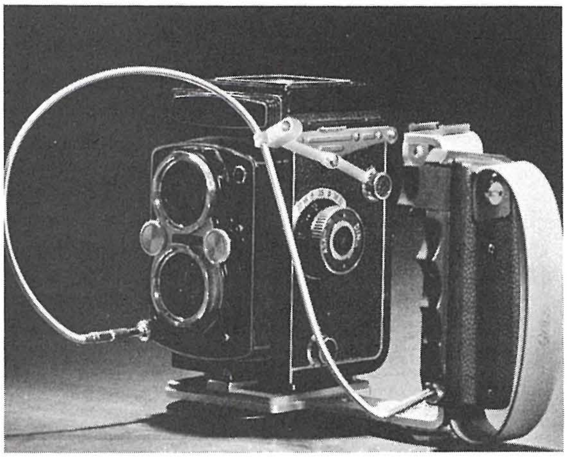


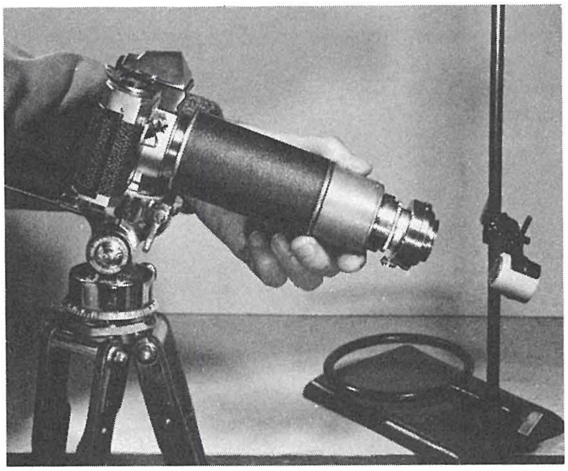
TAPE OVER FILM PREVENTS MISTAKES: If you don't develop your film right after you load it into your film tank you may forget you've loaded it—or forget what type of film you've loaded. Fastening a piece of tape around the lid will remind you (and others) that the tank is loaded. Write the film type and developing time on the tape.



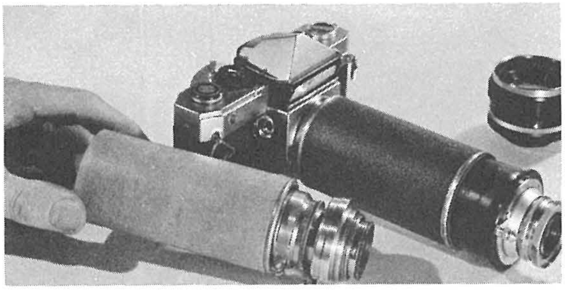
ERASERS CUT DARKROOM ERRORS: The rubber erasers that slip onto pencils can slip helpfully into your darkroom, too. They can give you a better grip on the knobs of some photo timers (above, left), while keeping the timer's metal from contamination by any photo chemicals on your hands. And erasers over the ends of glass darkroom thermometers (above, right) help protect them from breakage, without interfering with temperature measurement.



HOW TO RESTRAIN A CABLE RELEASE: Cable releases have a way of swinging in front of your lens just as you shoot, but they may bind if you wrap them around the camera to prevent this. An easy way to keep your cable release where you want it is to restrain it with a plastic cable tie, or with one of the plastic ties often supplied with plastic trash bags. On some cameras, the tie will pass through the camera's neckstrap slot or "D" ring; on most others, it can be pierced to fit over the camera's strap lug or some other projection.



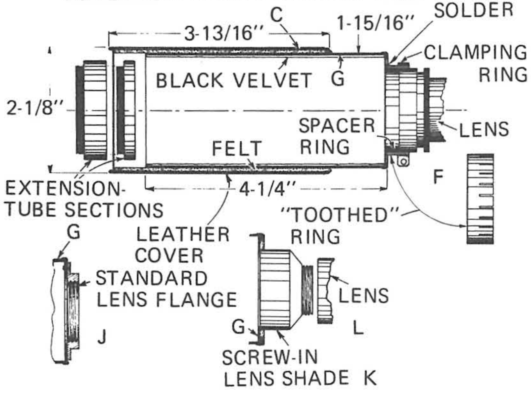
SHOOTING COIN (see below); note reversed lens.

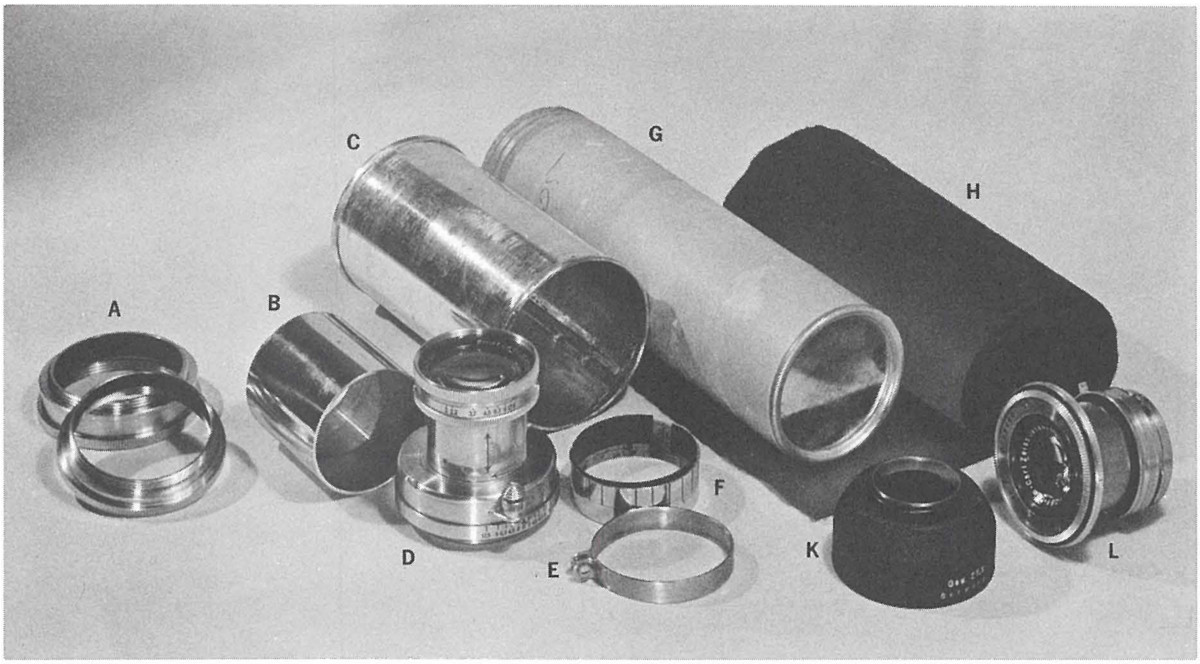


INTERCHANGEABLE inside tubes add versatility; here, to hold one lens normally and another reversed.

SHARP CLOSE-UP made with setup on opposite page; this token has been enlarged four or five diameters.

REVERSIBLE-LENS FOCUSING TUBE



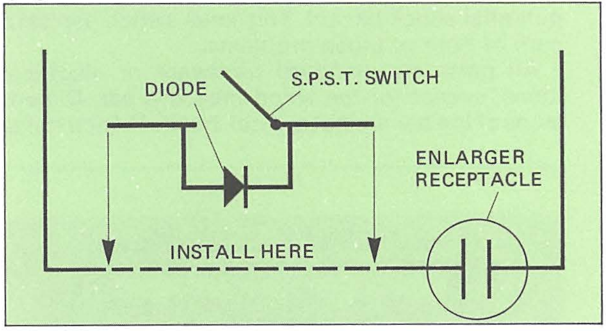


INSTEAD OF A BELLOWS close-up attachment for my single-lens reflex, you can build an adjustable focusing tube—from junk parts. Basically, it's just two tubes, one sliding within the other (see diagram at left). Make the outer tube (C in the diagram, also in photo above) from a small frozen-juice can, with one end removed. The inner tube (G in diagram and photo) could be another can, if you have one that fits, or a cardboard tube with a metal end cap.

Cement a lining of dark felt inside the outer tube, to provide a light-tight seal and a cushion for the inner tube to slide in without play. Cut a carefully centered hole in the back end of the outer tube, just large enough to clear your lens mount; then screw two short, extension-tube sections through the hole (see diagram) so you can mount the completed focusing tube to your camera.

Line the inner, sliding tube with black velvet, or other nonreflecting material. Make another carefully centered hole in this tube's end cap, for a fitting to hold your lens. This could be a standard lens flange (J in the diagram); it would either bolt on or screw on with a retaining ring. Reversing adapters, also available for many lenses, allow you to reverse the lens end-for-end for a little added sharpness in extreme close-ups; if you can't find one, you could make a clamping attachment like that shown as "F" in the diagram. Cut a ring from brass tubing, saw slots to form a series of clamping fingers, line it with plastic electrical tape and compress with a screw-tightened ring or hose clamp, to hold it on the lens barrel. This ring can be soldered or welded to the end cap. Or you can fasten a lens shade to the tube, and screw on the lens, reversed.

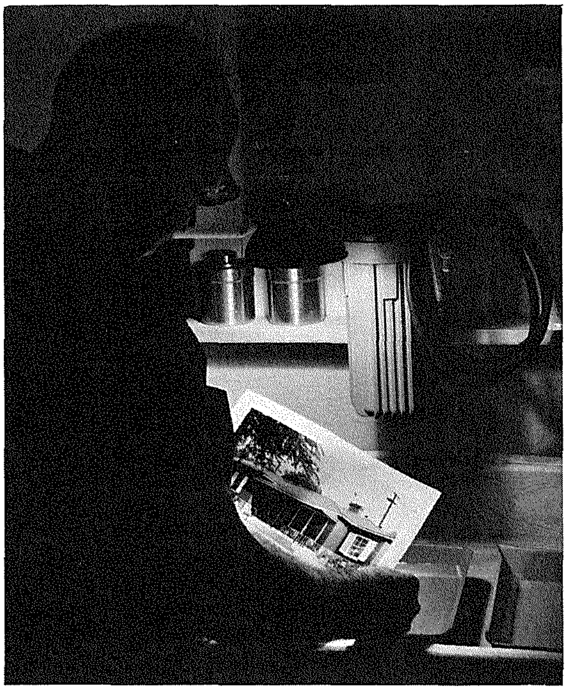
FOCUS-TUBE PARTS: Extension tubes (A) hold juice-can outer tube (C) to camera; lining of felt (H) inside C seals and cushions slide of inner cardboard tube (G). Lenses (D, L) can be fastened with lens flanges (not shown), with reversed lens-hood (K) to fit lens (L), or with toothed ring (F) made from brass pipe (B) and clamped to lens with clamping ring (E). For details, see diagram on page at left and text.



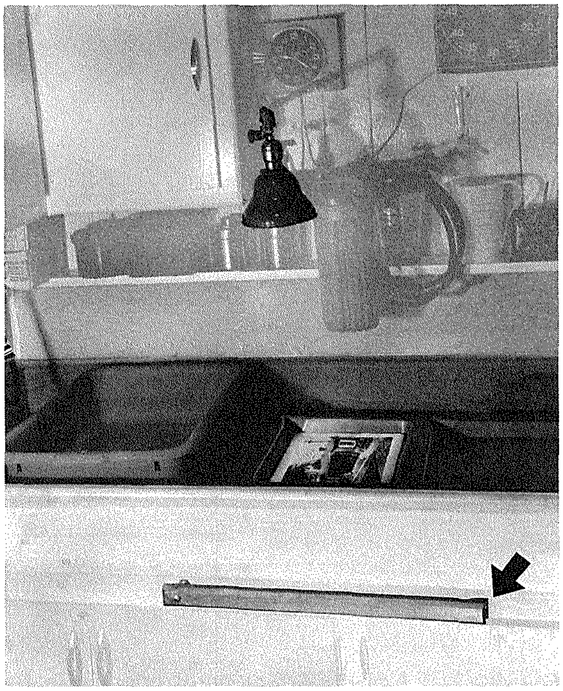
DIODE DIMS ENLARGER: Printing "thin" negatives requires either stopping down your enlarger lens to f/22 (not its sharpest aperture), using exposure times too short to allow dodging and burning-in, or both.

This simple intensity switch can help by allowing you to cut your enlarger's light output in half whenever you need to. It's simply an s.p.s.t. toggle switch placed in parallel with a silicon diode and wired into your timer's enlarger socket. With the switch open, the diode allows only half of each a.c. cycle to power the lamp. Closing the switch restores normal operation. The diode should have a rating of at least 2 amps. at 400 PIV. Polarity is unimportant.

If there's no room in your timer for the switch, you can mount the switch, diode, and a duplicate receptacle in a minibox. Remember to connect the box between the timer and the enlarger, not between the timer and the a.c. line.



AN INSPECTION LIGHT above the fixing tray is convenient; here's how to switch it on easily.

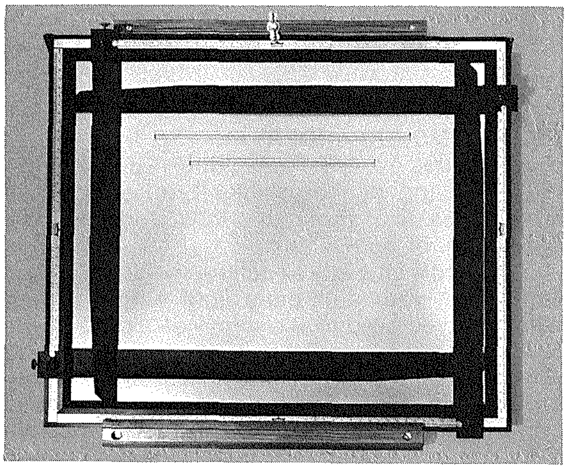


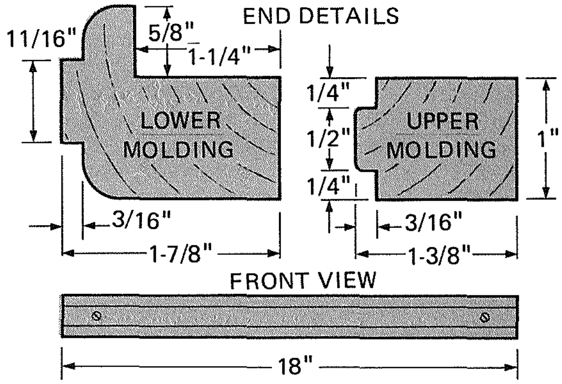
NUDGE THE BAR (arrow) with your knee and the light goes on. Release it and the light goes off.

KNEE SWITCH for print-inspection light: The best way to judge the quality of your prints is with a white light over the fixer tray. But turning that light on and off as needed can be both a nuisance and a potential shock hazard. This knee switch can take care of both of those problems.

All parts are standard hardware or electrical items, except for the wood pressure bar. Dimensions of the bar are not critical, but its ¼-inch holes should be counterbored ¾ inch to receive the washers on the switch actuator (4, on photo, facing page) and spring assembly (3). Locate the bar at knee level on your sink or counter front, near the fixer tray. The light may be turned on safely once the print has been in the fixer 20 seconds.

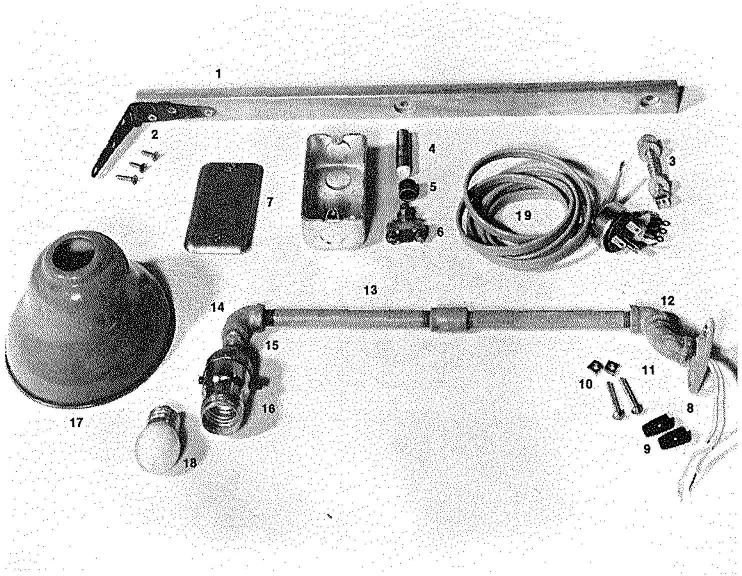
Parts are shown in approximately their assembled relationship. The switch (6) is a normally open type, mounted in a standard receptacle box, with





WALL-HANG YOUR EASEL: Two pieces of molding, one turn-button and four mounting screws can solve the problem of storing enlarging easels out of the way when not in use.

The easel actually rests behind the lip on the upper edge of the lower molding; the turn-button on the upper molding (which has no lip) holds it securely. Exact dimensions should be determined for your easel—the ones indicated here are for the 16x20 easel shown. With an easel of this size and weight, the moldings should be attached to your wall's studs; with smaller easels, the moldings can be mounted to a ¼-inch-plywood back and attached with two screws to a single stud.



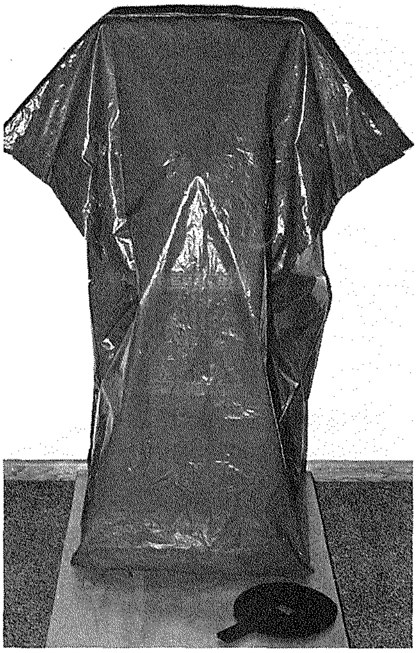
EXACT PARTS NEEDED will depend on your darkroom's layout, dimensions and other requirements. But as the picture shows, all parts can be made from standard switches and electrical hardware, stock pipe and pipe fittings, wood, metal rod, and other normal odds and ends from your shop. Even the guide bolt and compression-spring assembly (3) is made up from common, easy-to-find hardware.

List of parts for inspection light

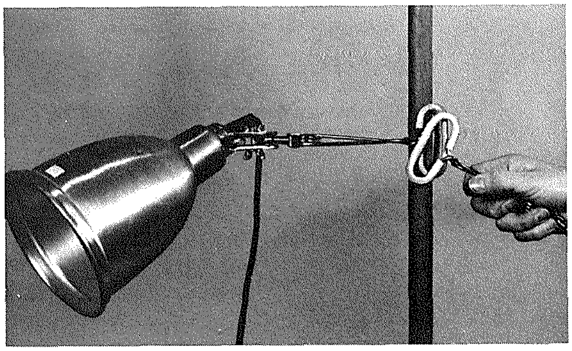
1. Pressure bar, 13/16 x 1¼ x 20″ hardwood.
2. 3″ strap hinge and screws.
3. Guide bolt, compression-spring nuts and washers.
4. ½ x 2″ metal rod with rubber bumper at switch end.
5. ½ x ¾″ bronze bearing.
6. Momentary switch N-O (normally open).
7. Receptacle box and cover.
8. ¼″ pipe waste nut and thread nipple.
9. Solderless connectors.
10. 3/16 x 1½″ mounting bolts plus nuts.
11. ¼″ elbow.
12. ¼″ elbow and thread nipple.
13. ¼ x 12″ pipe.
14. ¼″ elbow.
15. Reducer ¼ to ⅛″ pipe, plus ⅛″ pipe thread nipple.
16. Standard switch socket.
17. Bell-type reflector.
18. 7½-w. frosted lamp.
19. Three-wire cord with grounding plug and crimp connectors.

washers holding it in place in one of the box's knockouts. Locate this box under the sink, where it won't get splashed, and make sure it's properly grounded to the third wire of the three-wire plug, or directly to a waterpipe.

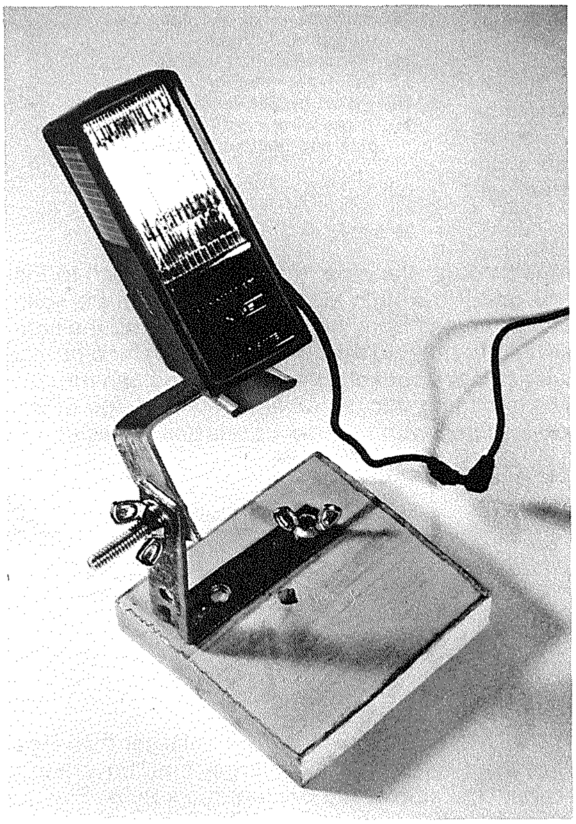
Where you mount the light fixture will depend on your darkroom setup. My light is mounted with pipe fittings to the side of a cabinet, so it can be swung out of the way when not in use. The wire runs through the pipe, then inside the wall to the box under the sink. Make sure everything is solid and protected from moisture, and ground the light assembly either to the third wire or a water pipe. It's wise to use a socket with a switch you can turn off when loading film, so an accidental nudge of the knee switch won't cause a darkroom disaster.



CHEAP ENLARGER DUST COVER: Keeping your enlarger dust-free can save you hours of print-spotting. But enlarger dust covers are expensive and not readily available as few dealers stock them. Plastic trash bags can do the same job for just a few cents. Here, a 30-gallon trash bag covers a big Beseler 23C. Smaller bags can store chemical trays and other darkroom items.



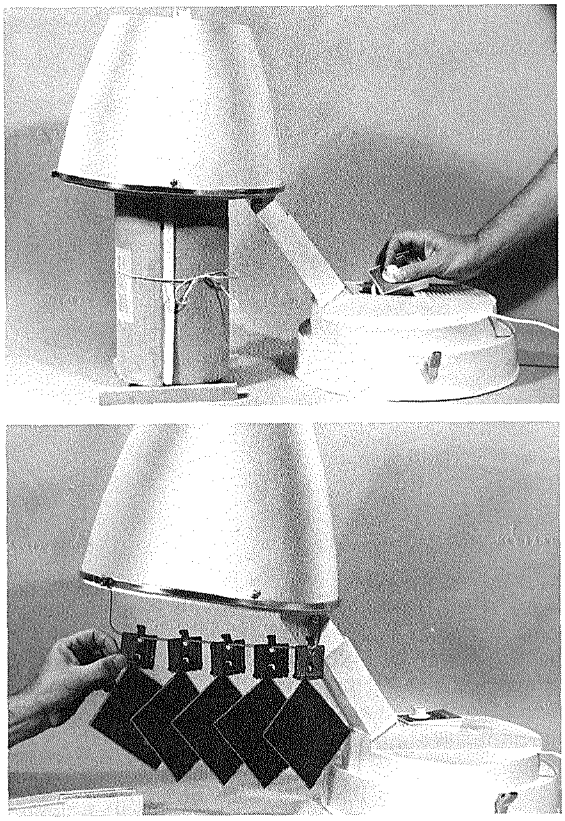
DOUBLED CLAMP IS TWICE AS STEADY: If your clamp-on photo lamps slip because their clamps are loosening, you can hold them in place by placing another spring clamp over the first one.

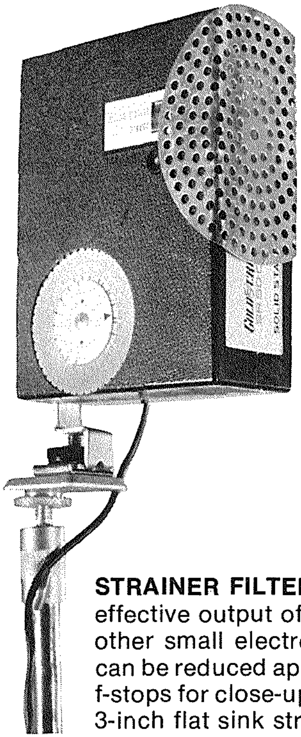


EASY BRACKET HOLDS FLASH: Holding the flashgun away from your camera, or adding off-camera extension flashes, gives your shots more interesting illumination. But how do you hold the camera and still aim a flash—especially a flash beyond arm's reach?

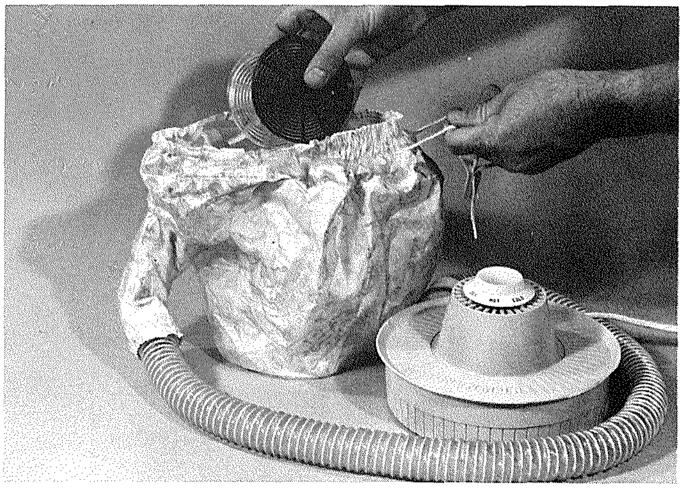
This simple stand can do it for you. It can be made in minutes from a small square of scrap ¾-inch lumber, plus a pair of standard 3-inch angle irons and a pair of ¼-inch bolts with wingnuts.

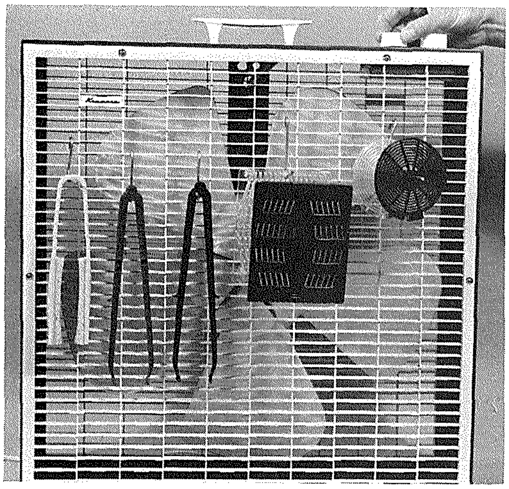
The mounting shoe for the flash is cut from a tin can, then formed with pliers and its sharp edges filed. A ¼-20 nut epoxied into a hole in the wood base (or a ¼-20 T-nut) also permits tripod mounting when required.





STRAINER FILTERS FLASH: The effective output of shoe-mount or other small electronic flash units can be reduced approximately two f-stops for close-ups, by bending a 3-inch flat sink strainer to fit over the flash head. Spring tension will hold it in place. Since strainers vary, make some tests first.





HAIR DRYERS, FANS EASE DRYING: Women's hair dryers have a lot of uses in the darkroom. The hard-hood type is an excellent device for quickly drying prints in a blotter roll; just be sure you prop up the roll as shown so air can circulate beneath it. With a coathanger wire beneath the hood, it also dries 4x5-inch sheet film. For roll film, place the dryer at the edge of the counter, and let the film hang down. If your film curls, use a lower heat. A soft-hooded dryer dries plastic developing tank reels quickly after one reel's developed, so you can load the next roll of film without its sticking. And the modern square type of household fan make an ideal dryer for reels, print tongs and other paraphernalia. Just make hanger clips from light wire to hold everything to the grille, and place a damp towel over the back of the fan to filter out dust.

DARKEN YOUR DOOR with weatherstripping. Close your darkroom door and stand there long enough to let your eyes accustom themselves to the darkness. You'll probably find it's not that dark, after all. Few doors make really light-tight fits into their frames.

But there's an easy way to seal your darkroom door and make it really light-tight: Use automotive weatherstripping. Because the adhesive that comes on the back of the stripping is messy and doesn't hold well if moved, first lay down a strip of double-sided masking tape which is clean, efficient and moveable. Then run the black automotive stripping on top of this. The tape can be pulled off later, if need be, without marring the finish of the wood.

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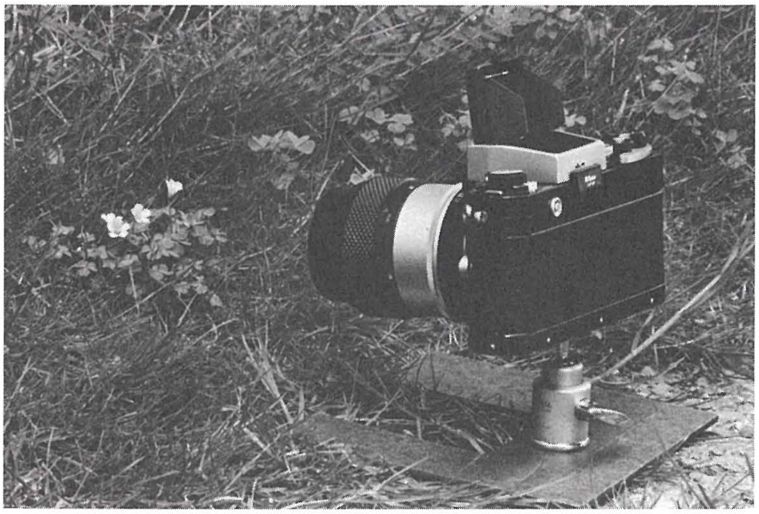
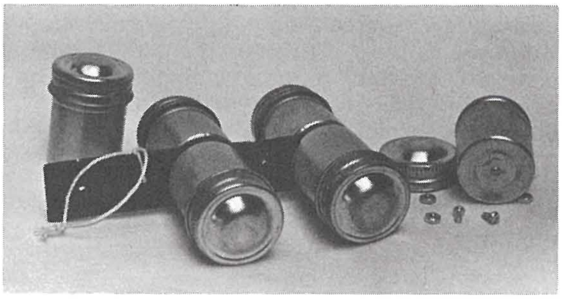
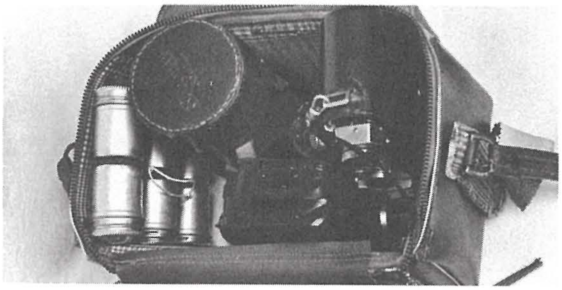
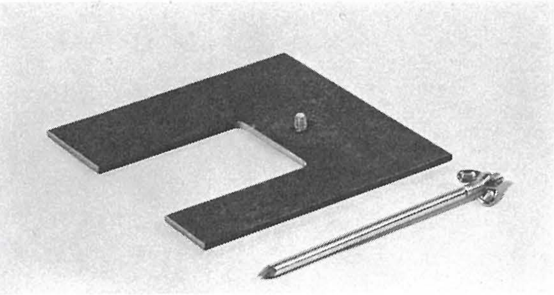


CLOSE-UPS of low-lying flowers and the like—or low-angle shots of larger objects—are easy with the Flatpod (shown in use above) and the Spikepod (upper photo at right). Flatpod construction (lower photo at right) is simple; the only materials are a ¼-20 screw and a piece of hardboard; unit works indoors or out. The Spikepod is for use in soft ground.

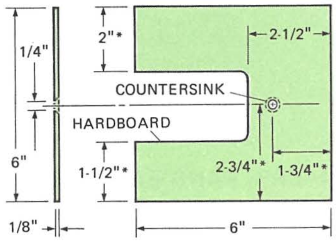
THIS INDOOR-OUTDOOR CAMERAPOD provides low-level close-ups, which normally aren't easy. Tripods which can hold a camera close to the ground often require accessories, or hold it upside down. And why tote two feet of tripod to hold a camera at a two-inch elevation? These solutions—the Flatpod and Spikepod—fit in your pocket, and can be made for less than $2.







*OR POSITION TO MATCH YOUR CAMERA



The Flatpod is made from a 6x6-inch scrap of hardboard. Cut a slot as shown for lens clearance, drill and countersink ¼-inch hole for a ¼-20 x ⅜-inch flathead bolt, and you have a low-level stand that will hold your camera and most macro lenses steady on any reasonably level surface. The lens clearance slot and tripod screw positions shown are for a Nikon; you may have to adjust them to fit other cameras.

The Spikepod is even simpler: just hacksaw off the head of a long ¼-20 carriage bolt and file the cut end to a point. Add a wingnut to tighten the spike to the camera. To use, just jam the spike into the ground. You can use three, four or six-inch bolts.

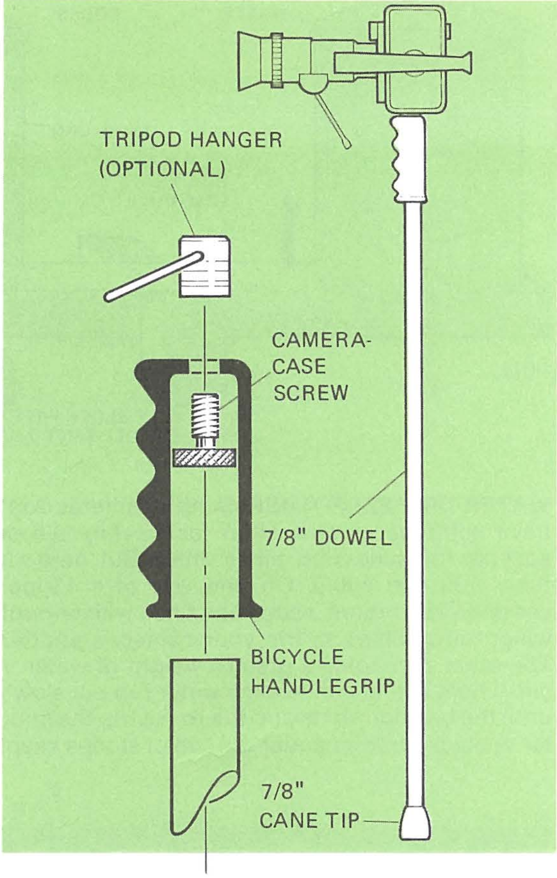
FILM HOLDER ENDS FUMBLING: Tired of groping for film in the bottom of your gadget bag? This easy-to-make film holder will end that. All you need is a 1x5-inch strip of hardboard, three 4-40 screws with nuts and lockwashers and six extra film cans. Drill a ⅛-inch hole in the bottom of each film can, and in the hardboard strip at the middle and ½ inch from each end. Attach two cans opposite each other at each hole. The new plastic film cans can be spaced closer together, but washers should then be used. If you like, you can drill an additional hole between two cans for a string to hold the strip on your belt or shoulder strap.

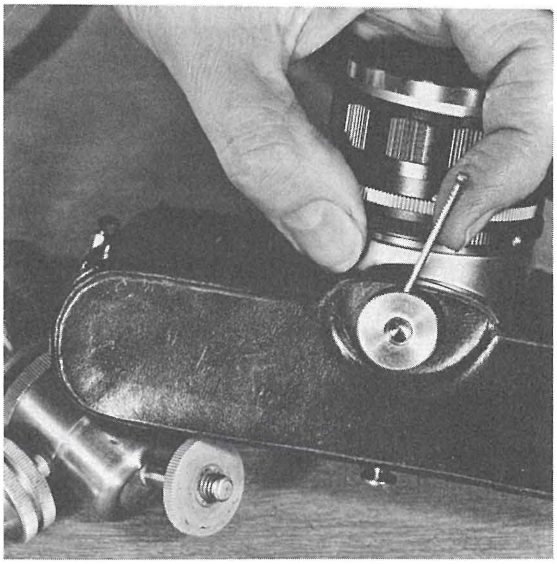
MAKE A BROOMSTICK UNIPOD: Add one more leg to the two you have already, and you're a tripod. That's the unipod principle. And while you and the unipod together aren't quite as shake-free as a true tripod, the unipod's much easier to carry.

A homemade version doesn't telescope like the commercial ones, but it's a lot cheaper, and at least as light and sturdy. All you need is a length of ⅞-inch dowel, a ⅞-inch cane tip, a bicycle handlegrip, and a camera-case retaining screw (available from photo dealers).

To put it all together, tape the retaining screw to one end of the dowel securely; then coat that end with glue and push the handlegrip down tightly over that end till the screw threads extend through the grip's end hole (most grips have one, but if yours doesn't, it's easy to punch or cut). Seat the cane tip on the dowel's other end, and you're done.

Length is up to you: A dowel long enough to raise your camera's finder to your eye level is steadiest, but most awkward to carry. This one is 36 inches high so it will double as a walking stick, and you squat or sit to use it. A tripod hanger ring helps keep the screw threads clean when not in use, and lets you attach a rawhide thong as a wrist strap. Another useful option is a golfshoe spike in the bottom, covered by the cane tip when it's not in use.



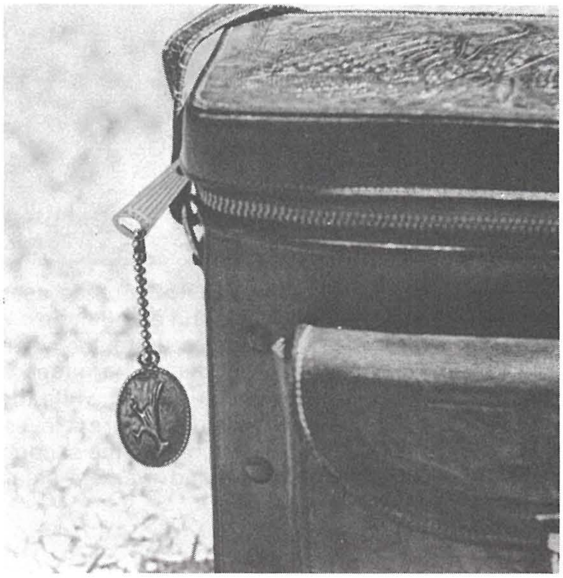


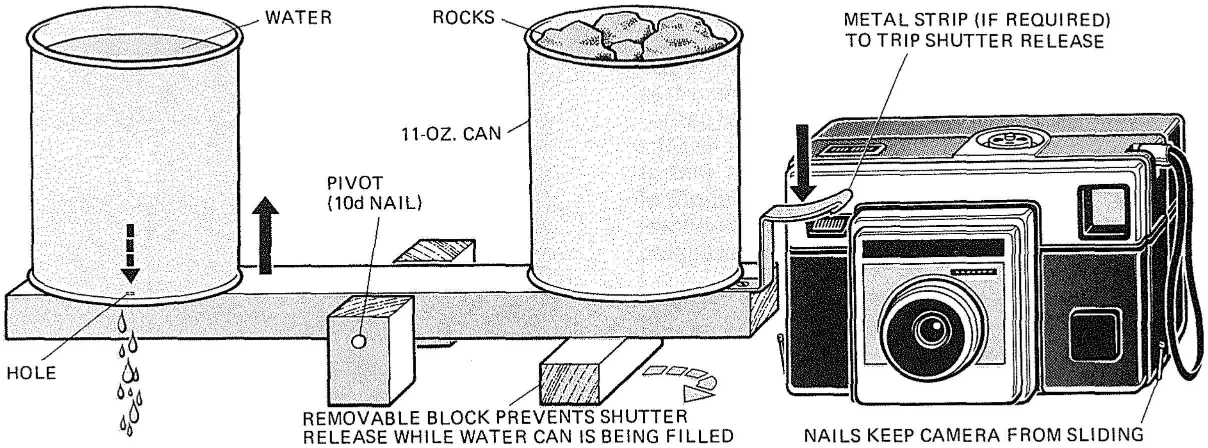
REMOVING CAMERA-CASE FROM TRIPOD: If you keep your camera in its case when it's on a tripod, you've probably found that turning the tripod screw often just turns the case screw around and around, loosening the camera, but leaving the case stuck to the tripod. And you can seldom get tools in between the case and the tripod head to grip and hold the screw.

A preventive is to drill, beforehand, one or more holes in the case screw's knurled edge, to take a nail that can act as a gripping level. Try to position the hole so it will be accessible when the camera is screwed down, and angle it away from the tripod-screw hole.

continued

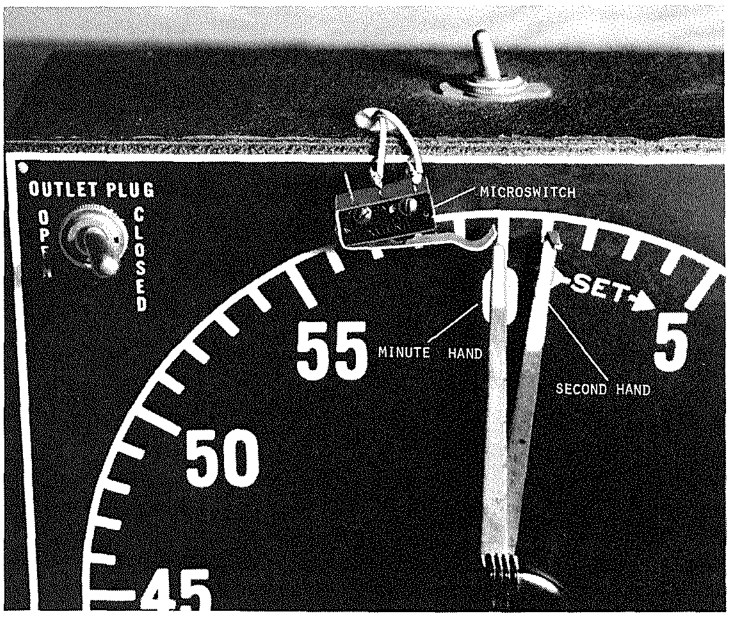
KEY-CHAIN TAB IMPROVES ZIPPER: If the zipper on your gadget bag is sticking, stop fighting with it. Just attach a key chain with an ornamental tab of your choice, and you'll be able to get a good grip on the zipper tab for a strong pull without fumbling.

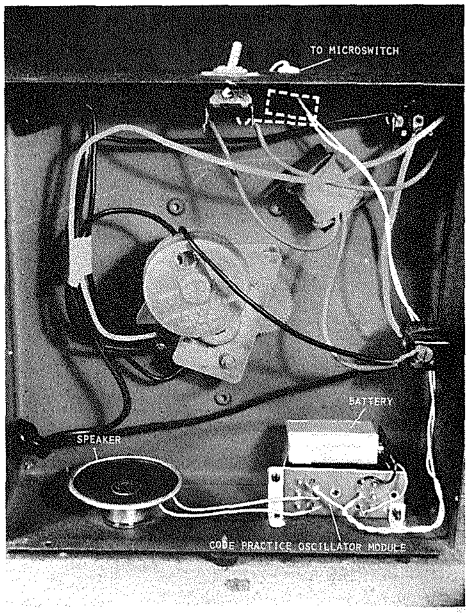



WATER
ROCKS
METAL STRIP (IF REQUIRED) TO TRIP SHUTTER RELEASE
11-OZ. CAN
PIVOT (10d NAIL)
HOLE
REMOVABLE BLOCK PREVENTS SHUTTER RELEASE WHILE WATER CAN IS BEING FILLED
NAILS KEEP CAMERA FROM SLIDING

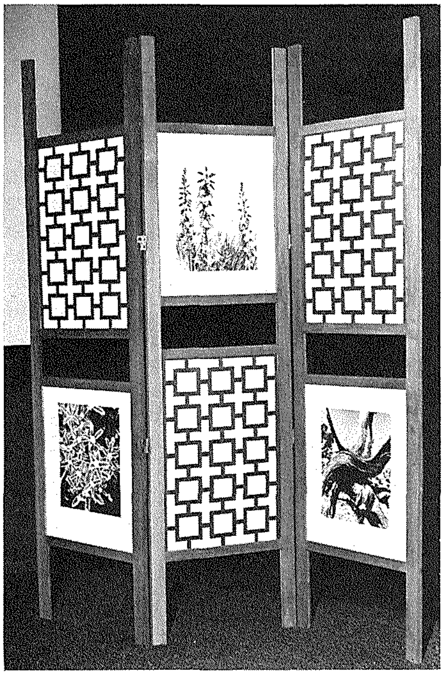
WATER-DRIP SELF-TIMER: Simple cameras don't have self-timers—and often lack cable-release sockets for accessory timer units. But here's a timer you can make. On one end of a 15-inch seesaw stick, mount a soup can filled with enough weight in pebbles to trip your camera's shutter. The other can holds a greater weight of water. A small hole in that can lets the water run out slowly until the balance shifts and the rocks trip the shutter. A block of wood under the can of stones keeps the shutter from tripping accidentally until you remove it.

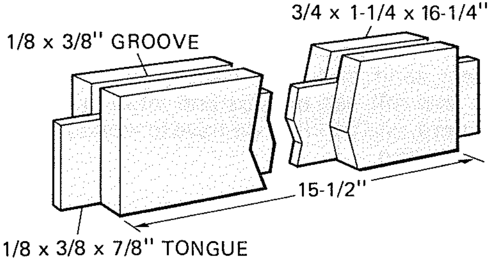
You can calibrate the water can for different delays, but 10 seconds seems best; too much more time, and the subjects get restless and change expressions—too little time, and you can't get into place before the shutter snaps. A bonus: most subjects are too fascinated by this weird gizmo to think about getting stiff and self-conscious.

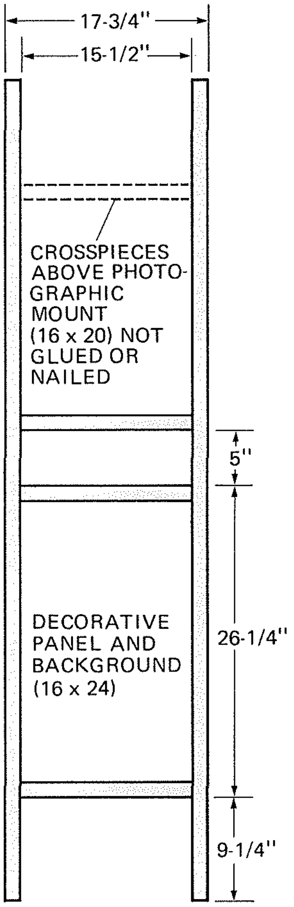


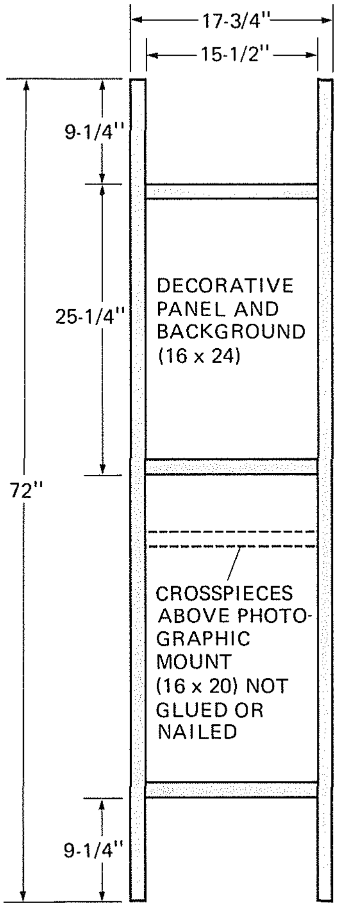


BEEPER IMPROVES LAB TIMER: One man uses his Gra-Lab timer for both printing and film developing. Since he can't always look up to see when he should agitate the film or paper, he added a "beeper" to sound off once per minute while the timer hands are moving. Parts used were a lever-type microswitch, mounted to contact the second hand as it passed the 60 second mark, a small speaker, and a Radio Shack code oscillator module with its battery taped on; but any equivalent parts should do. The oscillator is mounted inside the timer case with aluminum brackets, and the speaker is epoxied directly to the case. (There is adequate sound without baffle holes). The microswitch is mounted on a small wood spacer, so it won't interfere with the minute hand's operation.




DETAIL OF CROSSPIECE

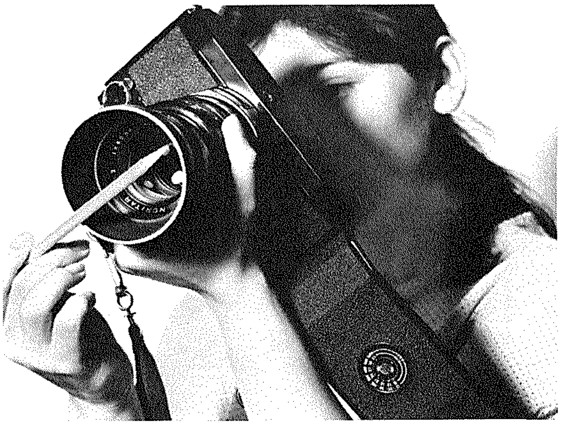

17-3/4"
15-1/2"
CROSSPIECES ABOVE PHOTOGRAPHIC MOUNT (16 x 20) NOT GLUED OR NAILED
5"
DECORATIVE PANEL AND BACKGROUND (16 x 24)
26-1/4"
9-1/4"
CENTER PANEL,
1 REQD.


17-3/4"
15-1/2"
9-1/4"
25-1/4"
DECORATIVE PANEL AND BACKGROUND (16 x 24)
72"
CROSSPIECES ABOVE PHOTOGRAPHIC MOUNT (16 x 20) NOT GLUED OR NAILED
9-1/4"
SIDE PANELS,
2 REQD.

FOLDING SCREEN DISPLAYS PHOTOS: This folding screen serves as both a room divider and a display for photographs—and the photos are easily changed.

Construction is simple, with each section built individually, then attached with folding screen hinges. Materials are readily cut from 1x2 stock, and can be cut for you by a lumberyard. Both the vertical and horizontal pieces have grooves ⅛ in. wide by ⅜ in. deep along one edge to hold the panels; the horizontal pieces also have ⅜ x ⅛ x ⅞ in. tongues to fit grooves of vertical supports.

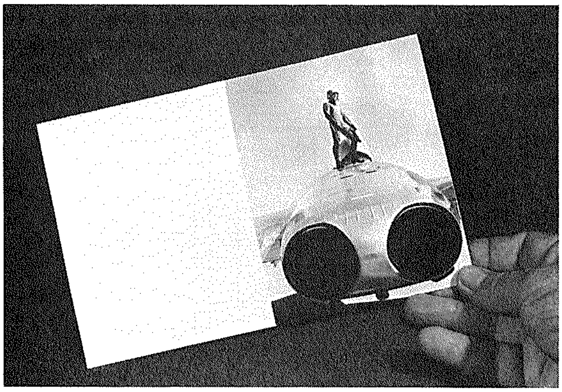
Each section was assembled with glue and small brads, but the horizontal pieces above the photos were not glued or nailed, so the photos could be changed easily. Decorative panels are of ⅛-in. plywood or hardboard filigree, stained or painted before the watercolor-board backing is applied. Photo panels are 16x20-in. print mounts; the prints are attached by dry mounting.



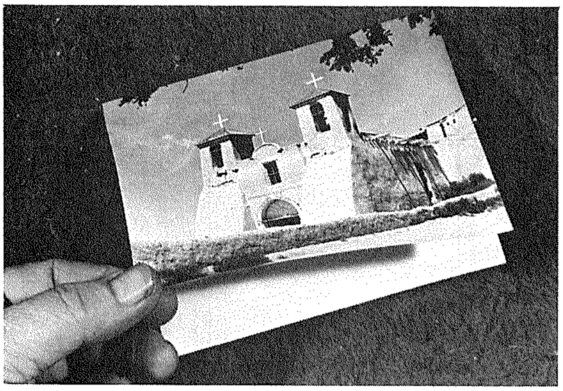
A VIGNETTING LENS HOOD: Your lens hood should be matched as closely as possible to your lens' angle of view. Too wide a hood admits stray light that can cause flare; too narrow a hood darkens or "vignettes" photo corners.

To check for vignetting, mount the hood, open your lens to its widest f-stop, lock the shutter open, and look through the lens from behind each corner of the film framing aperture in the back of the camera. Darkened areas in one or more corners indicate vignetting.

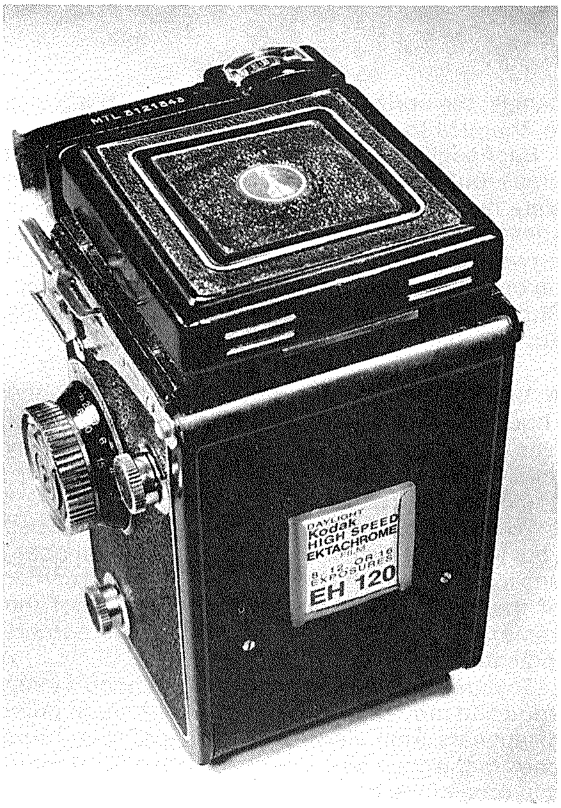
To cure it, hold a pencil against the hood's inner edge and move it back slowly until its sharp point disappears from view. Mark that spot, trim hood back to the mark with a hacksaw, then file smooth and repaint the edge black to prevent reflections.



PRINT ON THE RIGHT HALF, leave the left half blank, and fold the paper on the centerline.



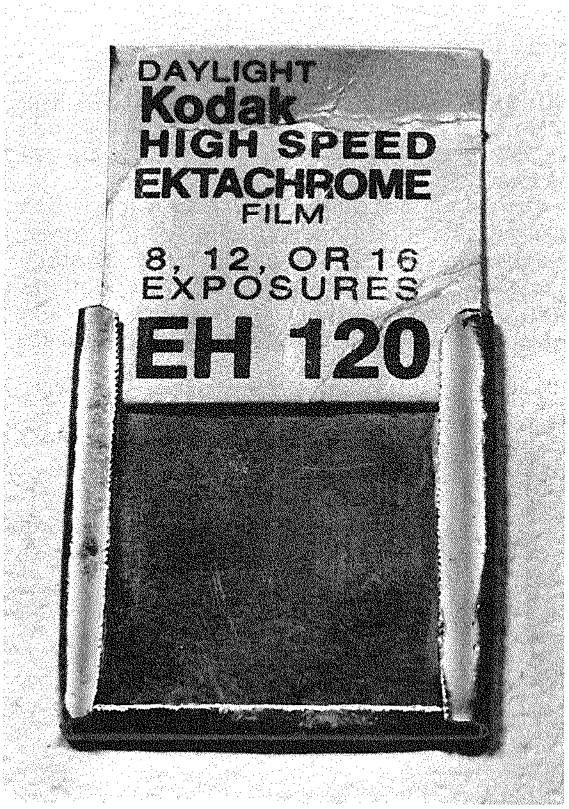
EMULSION ON THE OUTSIDE carries the picture, while paper's back surface, inside, is easy to write on.

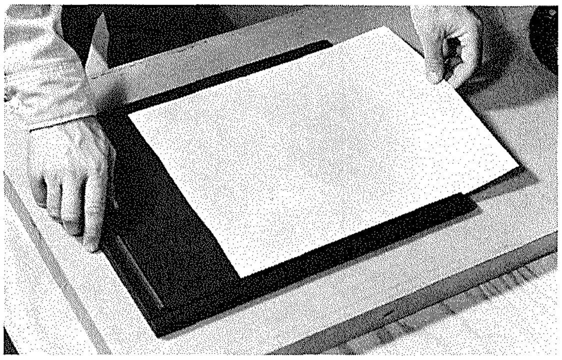


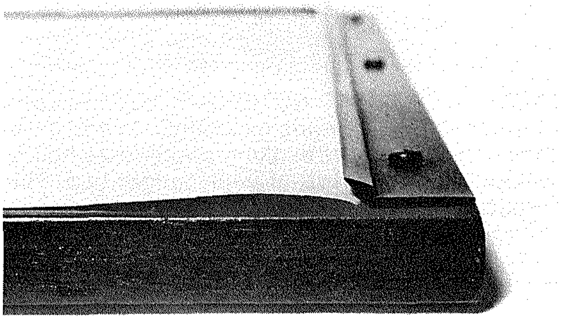
PHOTOS MAKE NOTE CARDS: Turn your favorite photos into photo notes, and you'll get a lot more mileage from them. Cut 8x10 single-weight, matte paper into 5x8-inch halves (double-weight or glossy papers are more likely to crack), and print your picture as a vertical or horizontal on the right half of the sheet, so that it makes the front of the note when folded; mask off the unexposed half of the paper during exposure, to avoid fogging it. If it's a shot you're especially proud of, you can print it across the entire sheet and fold the picture in the middle; the recipient can fold it out again.

Since unmounted, single-weight paper has a tendency to curl, use print-flattening solution (or print on Kodak's "RC" resin-finished papers) and keepyour finished note cards flattened between blotters until you use them.

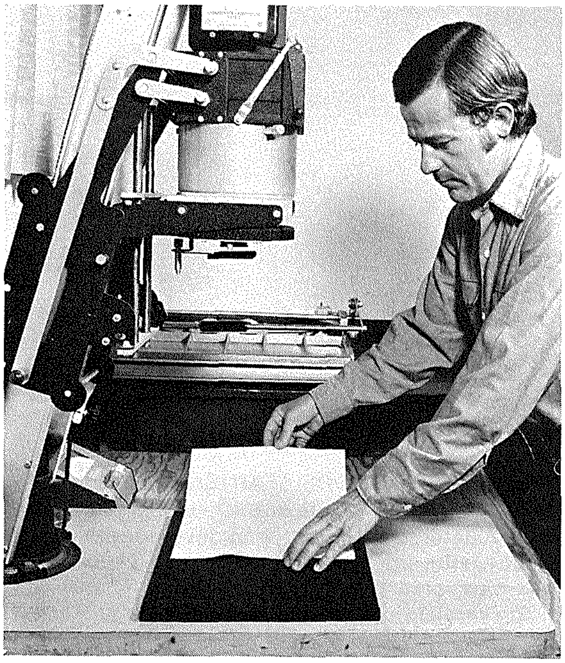
FILM-TYPE REMINDER: Trace a film box's end flap on a scrap of aluminum flashing, and cut with metal snips (or scissors), leaving enough metal around the outline to allow three bent edges as shown (box end flaps slip in the open end). Bend with pliers, sand, and glue or epoxy on. When you put in a new roll, slip the box end into the slot on your camera, and you'll never have to wonder what you're shooting.



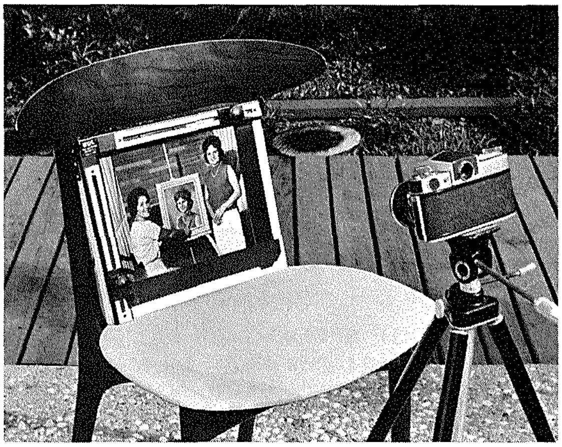




SLIP-IN EASEL (above and right) can be made to fit any size paper, is easy to load in the dark or under safelights. Black paint keeps reflections from fogging paper and reminds you to focus on blank sheet. Detail (above) shows how molding holds down paper edge.

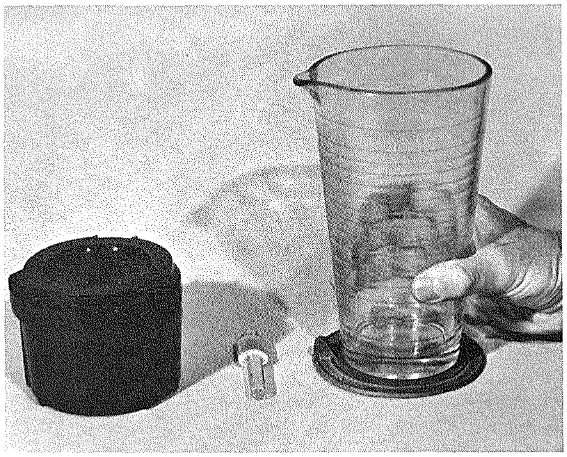


MAKE A LOW-COST 16x20 EASEL: Easels for 16x20 enlargements are rather expensive—especially if you don't make such big enlargements very often. So I made my own for less than $4, and in approximately two hours' time. It's just a piece of half-inch plywood that is cut two inches wider and two inches longer than the paper size it's designed for. (If you cut your paper to custom sizes—for full-negative prints from 35 mm, for instance—you can build the easel to fit them, too.) Cut three strips of No. A-749 metal edging (available from most of the better hardware stores) to fit three of the paper's sides, and mount them, flat-side down, on the plywood base with ⅜-in. x No. 4 sheetmetal screws. This will leave a small groove between the wood base and the metal edging that's intended for the paper to slide into. Paint easel flat black to prevent flare in printing.

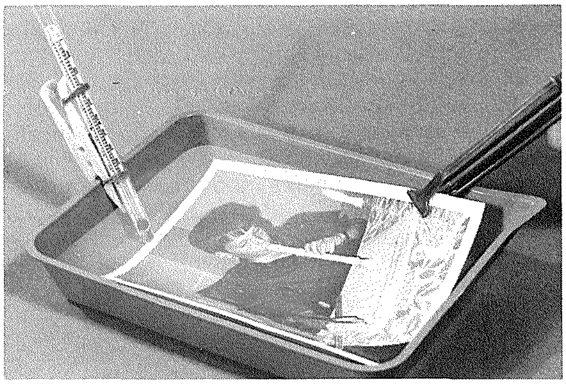


EASEL BECOMES COPY FRAME: An enlarging easel and a copy frame have the same basic purpose: to hold a piece of paper flat. So if you have an easel, you have a ready-made copy frame, too. To get the even lighting that copying requires, you can use soft daylight—wait for an overcast day, or prop your easel up in the shade of a building where it gets even skylight, not direct sun. The easel borders needn't appear in your final print. Normally, I move in closer with my camera to crop out the easel border, and crop out whatever is left of it when I make my enlargements.

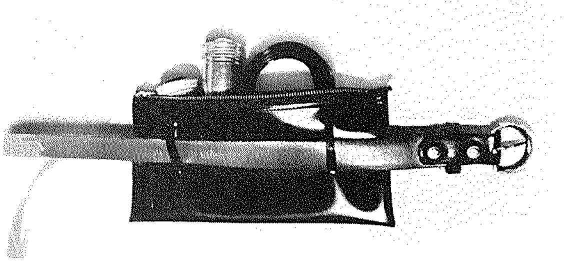
continued →



SINK STOPPER STOPS STAINS: A large, flat rubber sink stopper, like the one shown here, makes a good coaster to catch drops of developer that may run down the sides of your tank or beaker and stain your darkroom benchtop. (Regular coasters are far too small for this.) Look for a stopper with a flat top, as many have central humps which you must otherwise cut off.

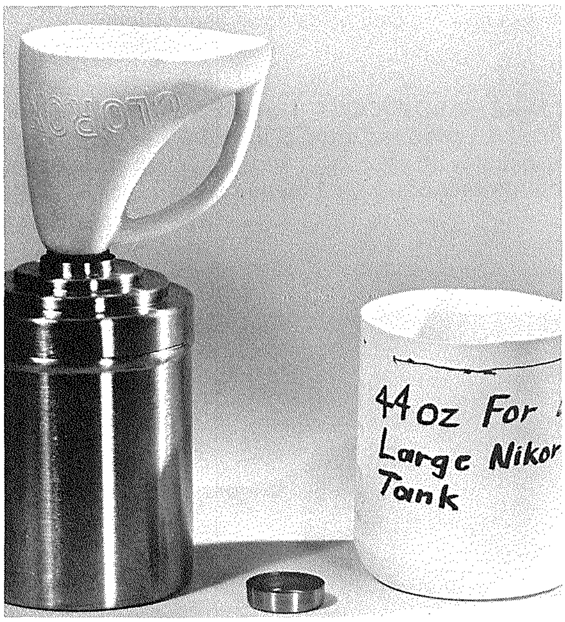


CLOTHESPIN CLIP FOR THERMOMETER: A darkroom thermometer is easier to see if it's fastened with rubber bands to a plastic clothespin (wood ones absorb chemicals) and clipped to the side of your tray.



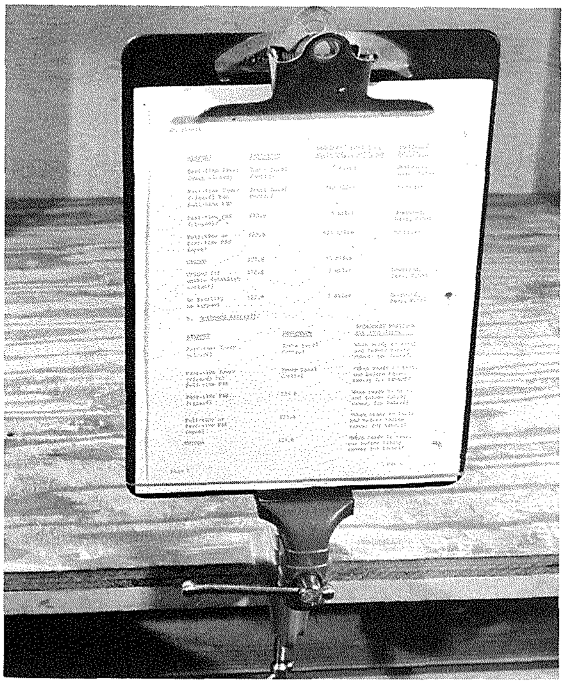
BELT CARRIER FROM A PENCIL CASE: A plastic pencil case makes a fine belt holder for small camera items such as extra film, filters, shades, cable releases. Cut two slits near each end to form loops to slip the belt through. The zippered case is easy to open and close with one hand while holding a camera with the other.

TAPE HOLDS PHOTO NOTEBOOK HANDY: Keep a notebook for recording exposures, filters, locations and other picture-taking information handy by taping it to the top of your gadget bag. The notebook is always easy to find, and the bag's top makes a good, portable writing desk. When in a hurry, you can take notes without even taking the bag from your shoulder.



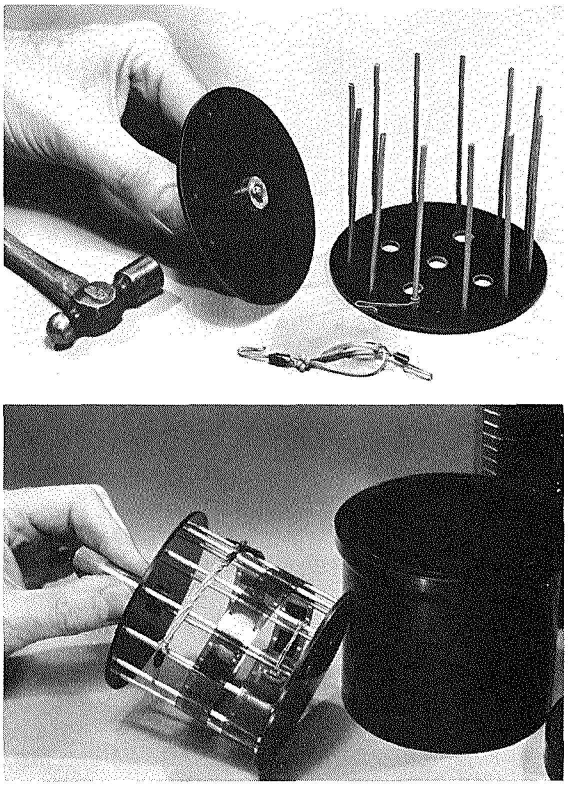
BLEACH BOTTLE SPEEDS TANK FILLING: Cut a thoroughly washed plastic bleach bottle in half, and the bottom makes a container big enough to fill your developing tank. Use a graduate to measure out the proper amount of solution, then draw a fill mark and label the volume on the outside with a brush pen or felt marker. The thin plastic feels flimsy, but when you pour, it conveniently deforms to make its own pouring lip. The bottle's upper half makes a handy funnel, complete with a convenient handle. Two gadgets from one bottle!

JUG KEEPS FILM COOL: A wide-mouth, insulated jug can keep your film cool in the summer and warm in the winter. The plastic-foam type is best because of its light weight. Just keep the jug open in your airconditioned or heated room at night, and close it in the morning.

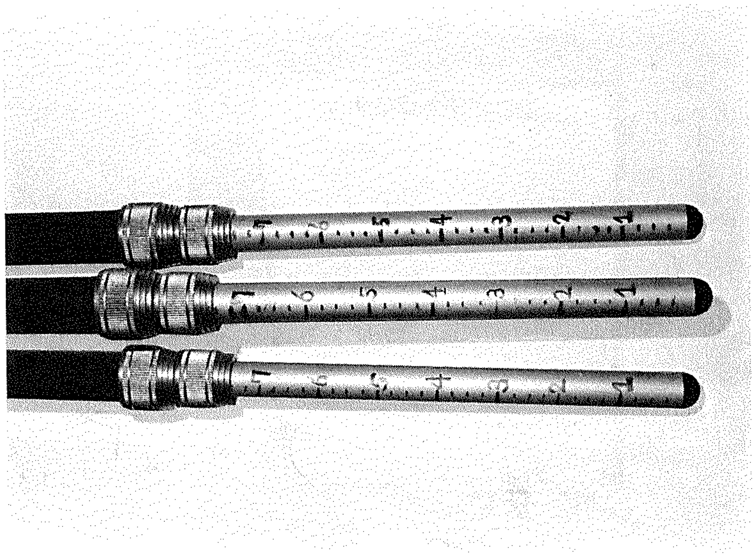


MAKESHIFT COPY STAND : A vise and clipboard make a good, impromptu copy stand. Use a rubber band to hold the bottom of the paper flat to the board.

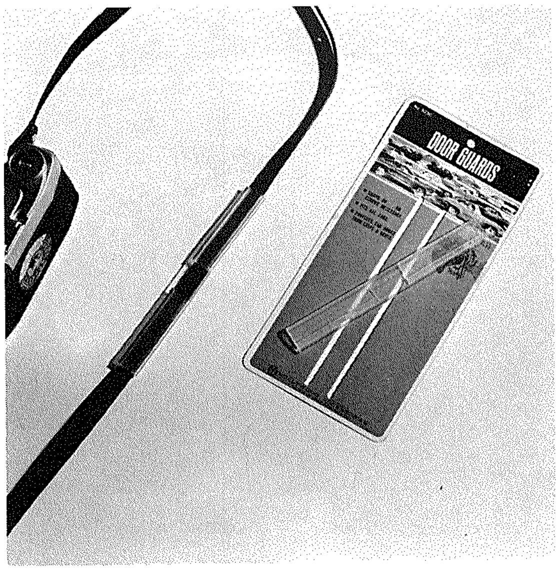
continued



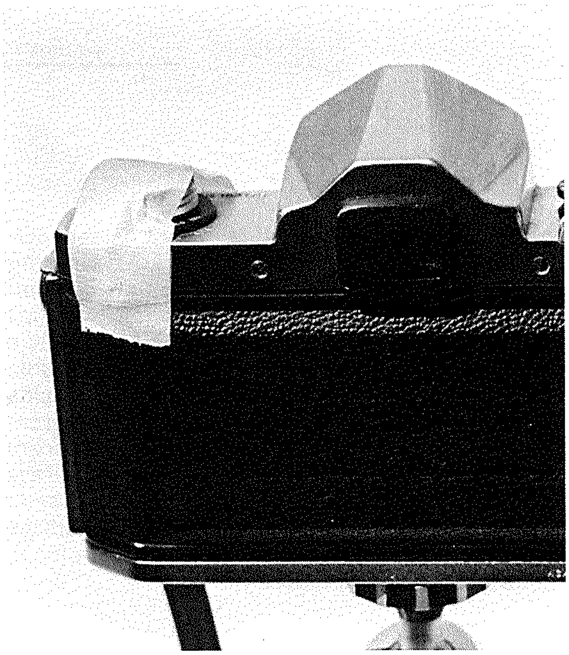
MINI-REEL FOR SMALL FILM: If your camera collection includes a subminiature pocket type using 16-mm film, you may find developing difficult without a special tank to handle such narrow strips in short lengths. An easy compromise is to make your own mini-reel to fit in a standard 35-mm tank. The one at left is 3⅜ inches in diameter and holds 34 inches of 16-mm film. Cut the end discs from Bakelite or similar material and the rods from ⅛-inch noncorroding wire. A short length of brass tubing or wood dowel makes a handle. The handle and rods can be cemented into holes in the discs with epoxy. Drill extra holes in the bottom disc to let developer circulate freely.



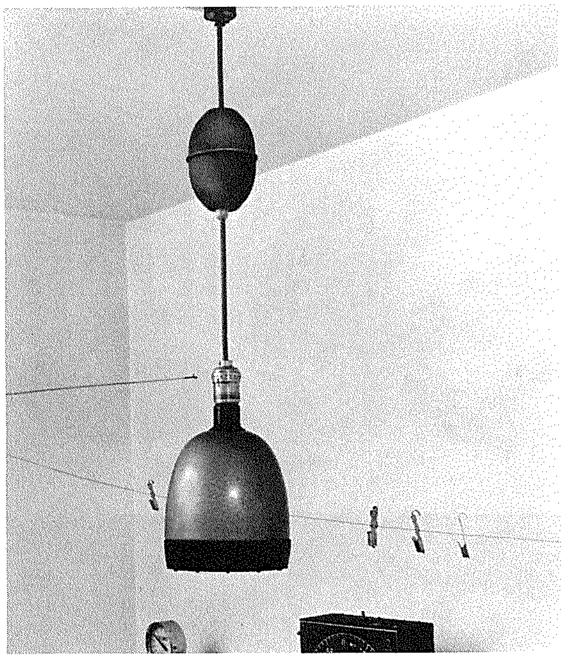
GETTING EACH TRIPOD LEG to come out exactly the same length can drive you up a wall. To eliminate this frustration, lay a ruler along your tripod's legs and lightly mark off measurements with a pencil. Using a small, pointed brush and quick-drying acrylic, paint each mark on permanently. If the legs are a tight fit, score the marks with a triangular file before painting; the paint will then be below the metal surface and won't rub off.



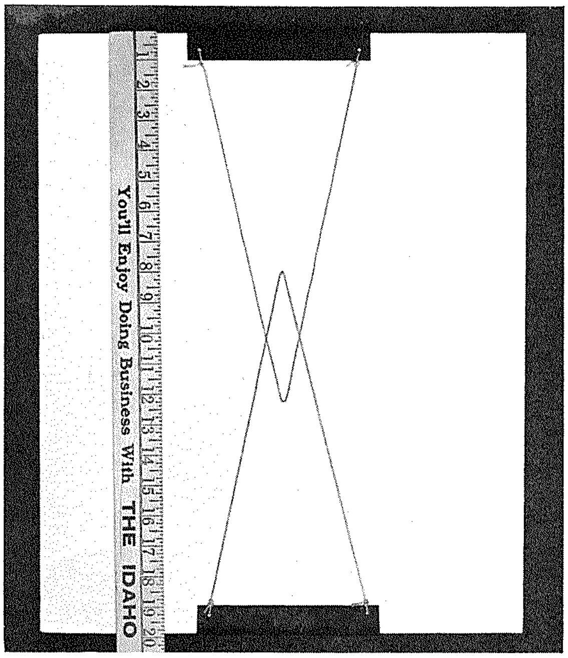
THE SHORT PLASTIC STRIPS sold in auto-supply stores as door-edge guards make good cushions for your camera neckstrap. Just insert the strap into the doorguard as shown, making sure the doorguard is centered on the strap and that the guard's cut area faces away from your neck. It will rest securely in position. Since the guards come in pairs, you'll have one for a friend, too, or for another camera.

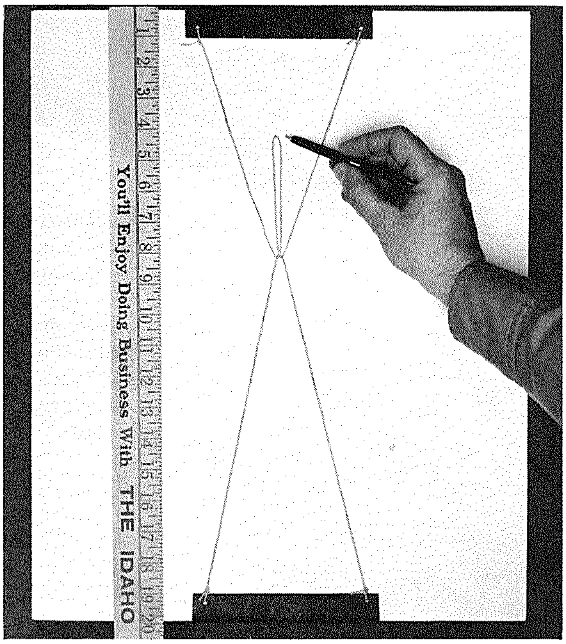


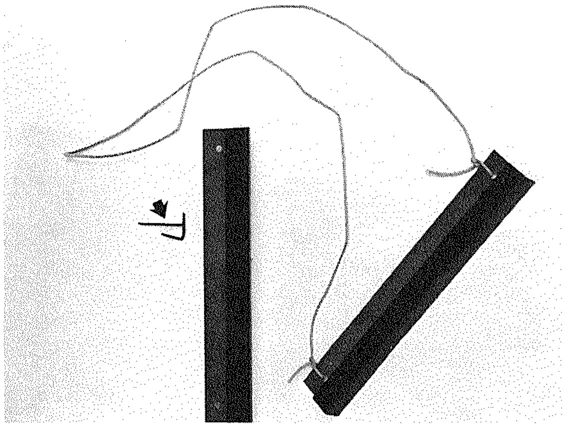
NOT ALL 35-MM cameras let you take deliberate double exposures; but those that do usually require that you hold down the rewind knob while winding the shutter for the second exposure. It helps if you draw up the slack film, then tape down the rewind knob *before* making the first exposure. Masking tape is fine for this purpose.

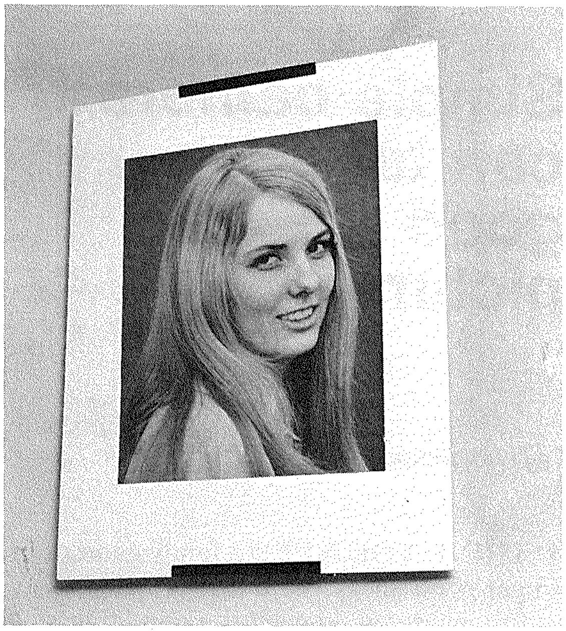


ATTACH YOUR SAFELIGHT to a pull-down reel of the type made for household light fixtures, and you double its utility. You can lower it over a tray for better inspection of developing prints, or raise it for more general illumination and to avoid fogging high-speed papers. This one is attached to a ceiling outlet, using a commercial type twist-lock electrical plug, but you can also mount it permanently, if you prefer.









SALON PRINT FRAME: No need to frame your photos and display them under glass. You can show them more effectively, informally and inexpensively by borrowing a tip from the salon exhibitor.

First, dry-mount your photo on mounting board (16x20 is a good size). Then buy a strip of outside-corner plastic molding as shown (arrow) in the photo below. This usually comes in several decorator colors. An 8-foot piece—enough for about eight pictures—should sell for around $1. Next, saw the molding into 6-inch strips, and drill or punch out two small holes in the long leg of each, as illustrated.

Cut two pieces of cord, each 6 inches longer than the mounting board, and tie them to the holes as shown below. Center the plastic molding on the top and bottom edges of the board, turn the print face down, and pass the loop of the top cord through the loop from the bottom cord (left). Now pull the cord tight, and hang the print from the tip of the top loop.

If you standardize on one mount size, you can change photos easily.

The outside-corner molding shown will hold the print about ¼ inch from the wall. If you prefer the picture to hang closer to the wall, you can use edging, which lacks the outside corner molding's rear projection. For hanging pictures high on your wall, use an outside corner molding at the top of the picture, and edging at the bottom, to angle the picture downward.

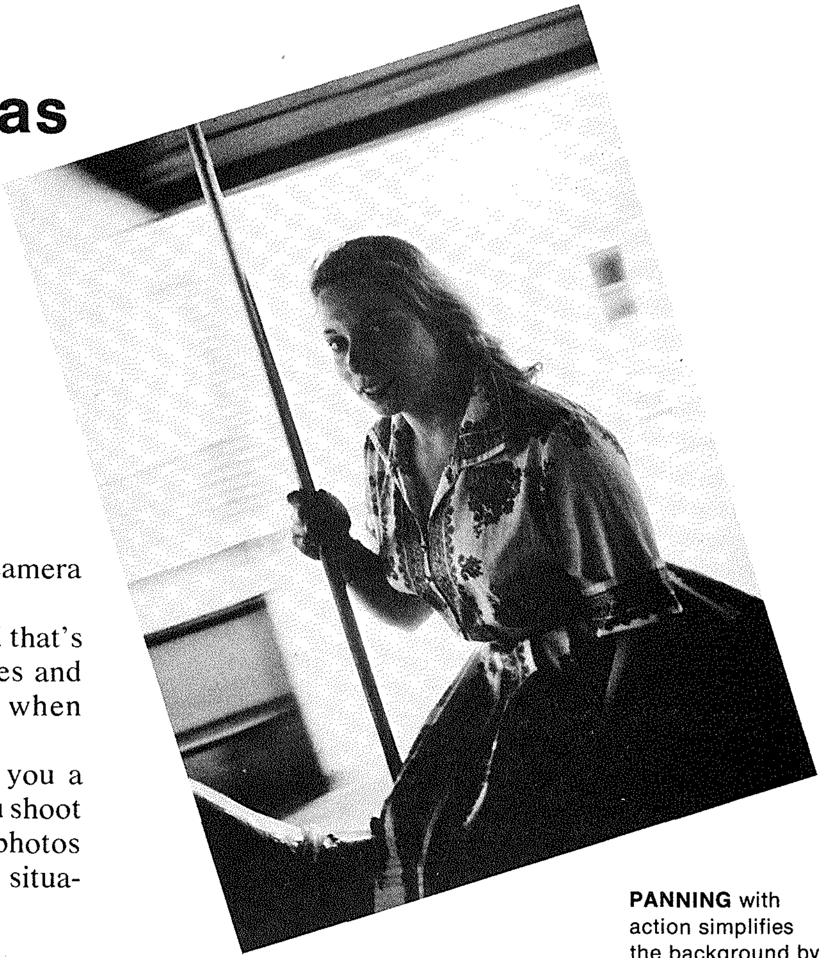
Simple cameras can take good pictures

By IVAN BERGER

THINK YOU NEED a fancy camera to get good shots? You don't.

But what you do need is a mind that's alive to what makes good pictures and that flashes a warning signal when you're about to take a bad one.

A $400 camera doesn't make you a good photographer. It just lets you shoot equally good (or equally bad) photos under a wider range of picture situa-



PANNING with action simplifies the background by blurring it while the subject stays sharp. The trick can work even if your camera has a slow shutter.

BACKGROUND AND foreground are equally sharp with most simpler cameras. Using backgrounds that are as clean and simple as possible can make that general sharpness pay off with satisfying snapshots.

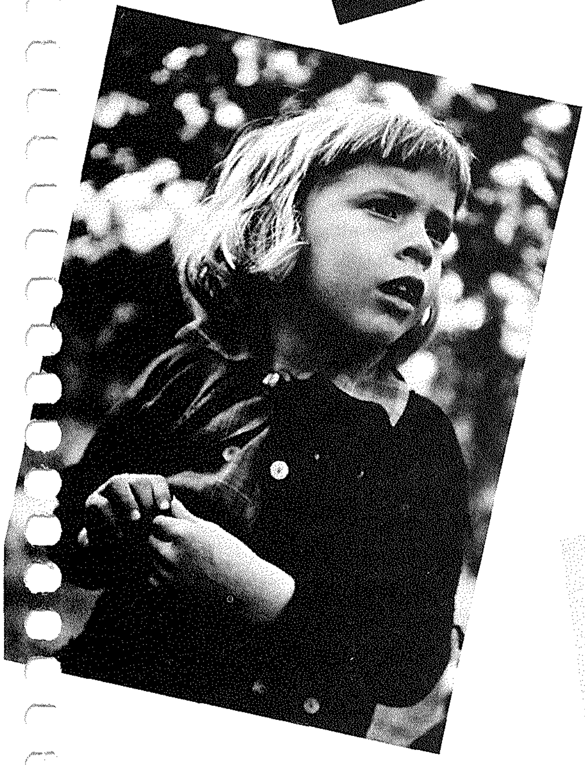
SEE ALSO

Cameras, care . . . Close-up photos . . . Lenses, photo . . . Montages, photo . . . Mountings, photo . . . Night photography . . . Outdoor photography . . . Photo hints . . . Prints, photo . . . Used cameras

EVER ready, a simple camera can help on quick shots like this. But you, too, must stay alert for such appealing photographs.

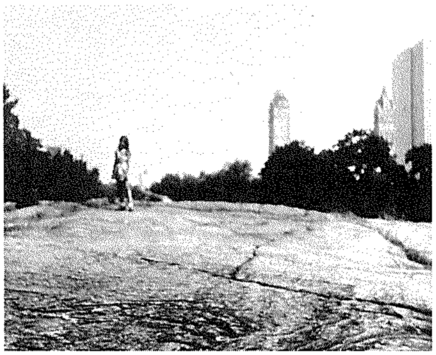
SOFT, directional window light is fine for portraits.

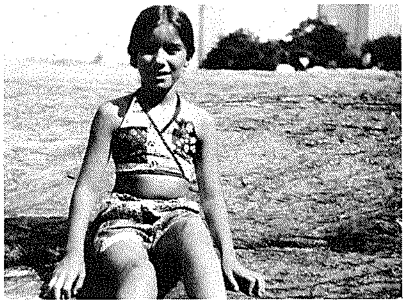
BACKLIGHTING puts a softer light on faces and highlights hair. And it saves the strained look of squinting eyes.

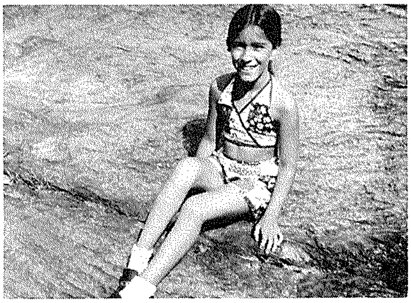


FOCUSING cameras can simplify a complex background by blurring it.

GOOD snapshots put subjects against a non-distracting background and show them living instead of posing.

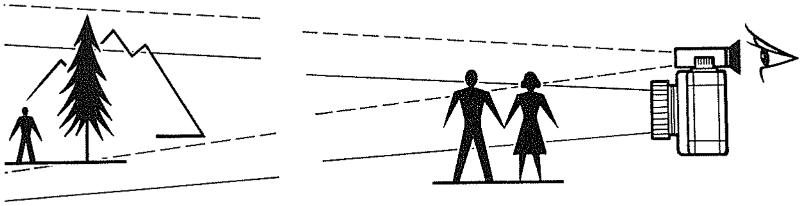


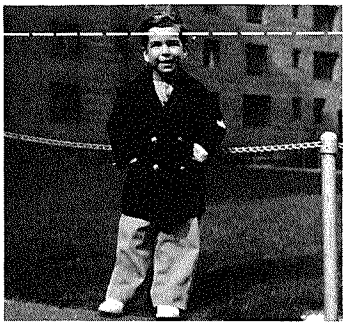




COMMON GOOFS abound here. The foreground at top left is nice and sharp, but there's far too much of it, leaving the center of interest remote and fuzzy. The moral: Move in close and check the focus. Close-ups (above) have their own problems. Arms and legs that project toward the camera swell disproportionately. The horizon line through the head, the harsh facial shadows and eyes squinting into the sun are other problems the photographer could have avoided. The higher angle at right simplifies the background and the better pose corrects the subject's proportions, cuts the distracting shadows and softens light on the face.

EMPTY FOREGROUNDS (left photos) may be easy to fill. I just waited for a ferry boat and maneuvered to get fellow tourists into the shot. (New Yorkers will spot this as an old photo: Manhattan's 110-story World Trade Center is missing.)





CUT-OFF HEADS come from parallax, the difference between the viewfinder's view and the lens' view of the subject. Parallax can be a big problem with close-ups, but viewfinders almost always warn what will be trimmed off. Otherwise you'll have to remember to leave extra room at the top in close-ups.

tions. And all the good techniques and horrible-example pitfalls shown here apply just as much to Nikons as to Instamatics.

With three exceptions, these photos weren't taken for this article. Among the cameras used were a $30 35-mm camera from a firm you never heard of, a Kodak Pocket Instamatic, a $30 Polaroid Super-Shooter, a folding Kodak from the early Thirties and an old, used Rolleicord. Can you tell which camera shot which?

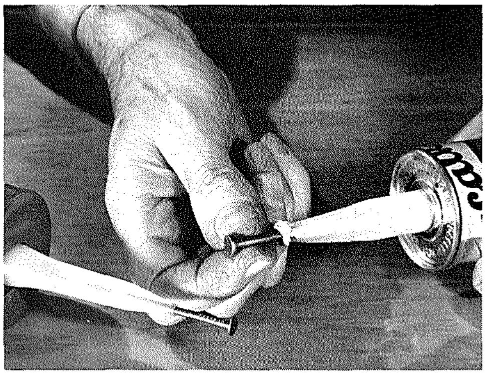
Here are some favorites we had to leave out of our picture layout:

Bad backgrounds. These range from the merely distracting to the classic telephone pole or tree growing out of someone's head. These problems are usually visible in the viewfinder if you look for them.

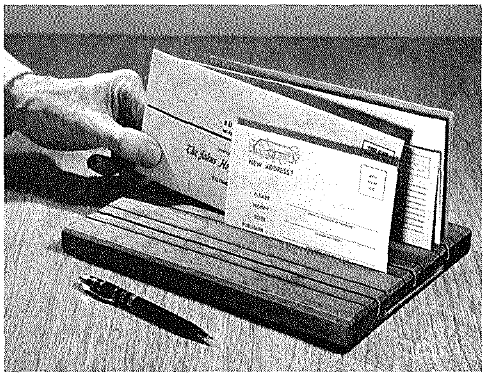
Bad shadows. Shoot with the sun over your shoulder, as so many photo books have recommended, and you not only get subjects squinting at the sun, you may get your own shadow in the picture.

Obstructed lens. Be careful your fingers aren't in front of the lens when you shoot; and keep your lens clean with soft lens tissue.

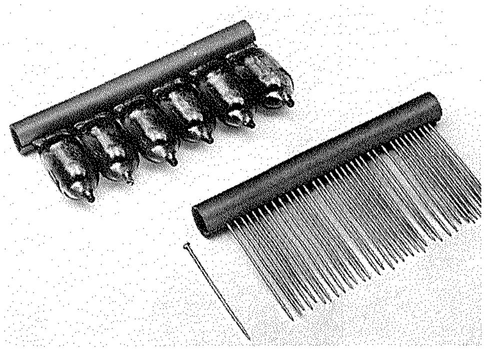
Bad flash. Read the instructions and find out the range your flash is good for. Try to shoot flash at 50 feet, and you'll just get darkness, while flash from too close can wash out details. If you must flash when a window or mirror is in your field of view, stand at an angle so the glass won't reflect light back in your lens.



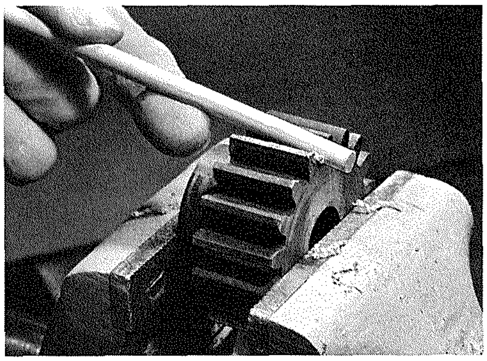
ONCE YOU SNIP the tip on a caulking cartridge, any leftovers will soon cake the spout if you don't plug the end. A flathead nail makes about the best plug you can find since it's long enough to extend all the way into the cartridge and its head is easy to grip and pull out. The nail keeps a hole free of caulk the full length of the spout.



A FEW PARALLEL saw kerfs, ½ in. deep and 1 in. apart, cut lengthwise in a block of fine cabinet wood make it an instant letter holder. If the edges are shaped and the wood given a couple coats of a self-rubbing finish, the holder can be an attractive desk accessory. A ¾ x 7 x 10½-in. block is about right. Some of the kerfs can be wider than others.



THE THROWAWAY HOLDER you get with miniature flashbulbs can be put to good use as a holder for pins, small screws, and cotter pins. You'll find the slit plastic holder ideal for holding a supply of bank pins used in modelmaking. Ordinarily difficult to pick up, the pins are simply slid off the end of the tube as needed.



THE NEXT TIME you want to reduce the diameter of a wood dowel or taper it to form a handle for a small tool, try using a steel gear as a shaving tool. Simply clamp the gear in the vise and pull the dowel between two teeth, so that the sharp corners will shave the wood. When the gear gets dull, resharpen it by filing across its flat surface.

REGULAR SELF-LOCKING bolts have a slot milled in the shank for a nylon pellet. The resiliency of the nylon exerts constant pressure against the nut, thus keeping it from working loose. Practically the same self-locking feature can be obtained with any bolt by first inserting a piece or two of nylon fishline in the hole.

Special effects put punch in your pictures

By BURT MURPHY

Creative, exciting effects are easy to add to your pictures. All it takes is practice and the right accessories, many of which you can make inexpensively yourself

SEE ALSO

Cameras, care . . . Enlarging, photo . . .
Lenses, photo . . . Montages, photo . . .
Night photography . . . Outdoor photography . . .
Panorama photos . . . Photo hints . . .
Portrait photography . . . Prints, photo . . .
Used cameras

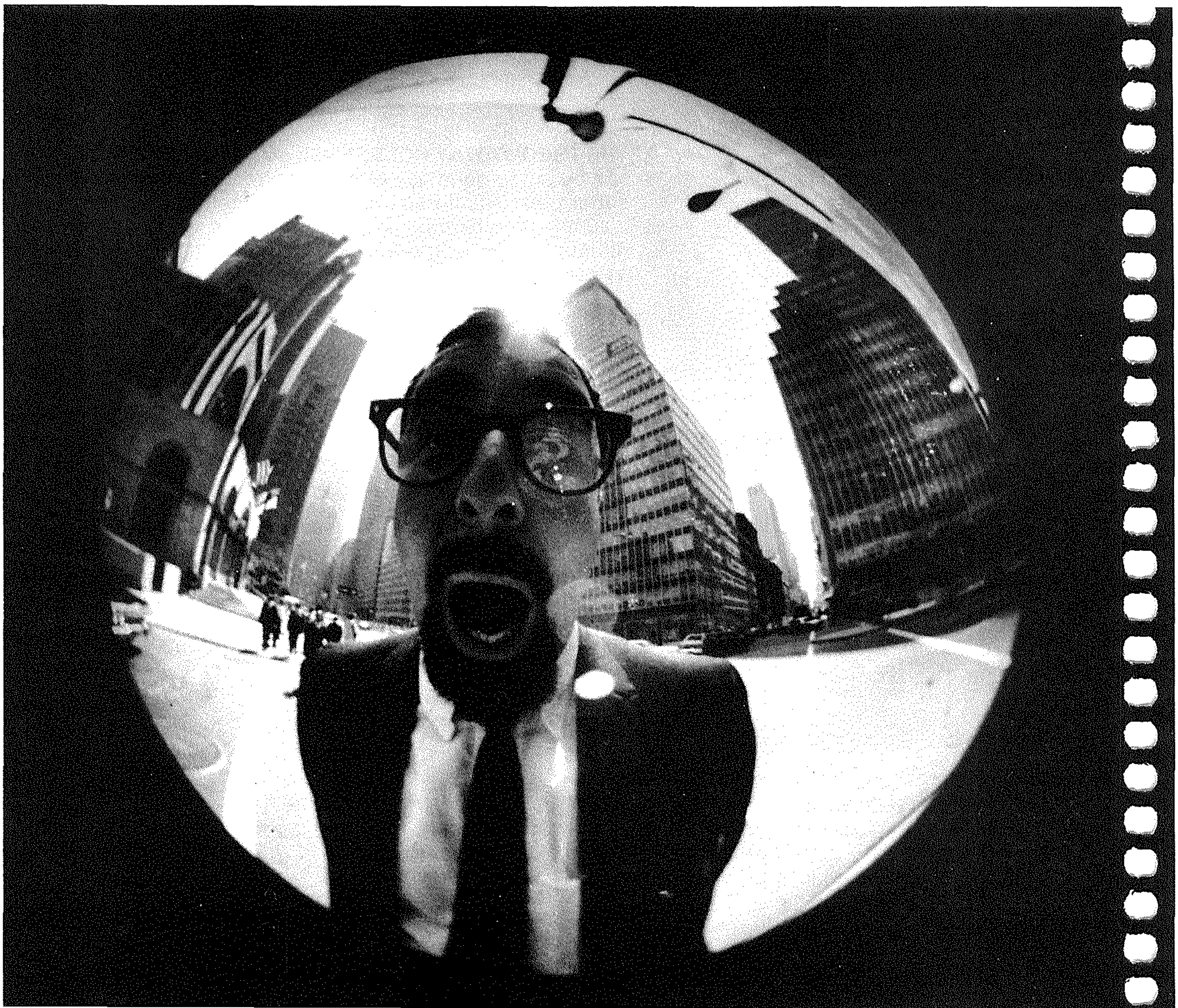
THE FUN IN photography increased when automatic cameras made good, clear photos easy, but automation took some of the fun away, too. You can recapture some of that fun—and dramatize your pictures—with easy (and mostly inexpensive) special effects.

With the right gadgets, a single-lens reflex, and a little know-how, you can:

- Take startling, 180° fisheye views.
- Shoot prismatic, multiple images.
- Vignette away portrait backgrounds.
- Soften portraits with soft focus or diffusion.
- Emphasize distance in scenic shots.

Fisheye shots are less expensive than you may have thought. True, fisheye *lenses* cost hundreds of dollars, but fisheye *attachments* start around $59.95 (for Spiratone and Prinz units) and can fit in front of virtually any lens on any camera.

Fisheye attachments work best on normal or moderate wide-angle lenses, such as a 50 or 35-mm on a 35-mm camera. With very-wide-angle lenses, the circular image may be too small. And



with long telephoto lenses, the curvature of the image is reduced and the effective f-stop becomes uncomfortably slow. Behind-the-lens meters may work with fisheye attachments; if not, or if you're using another type of meter, a ring on the attachment tells the true effective f-stop.

Fisheyes take in more than you may think possible at first. Until you're used to them, you'll find your pictures showing your feet, your tripod's legs or other things you'd rather not have in the picture. Fisheyes distort, but selectively: objects at the picture edge are always curved, but central objects aren't very distorted unless they're very close.

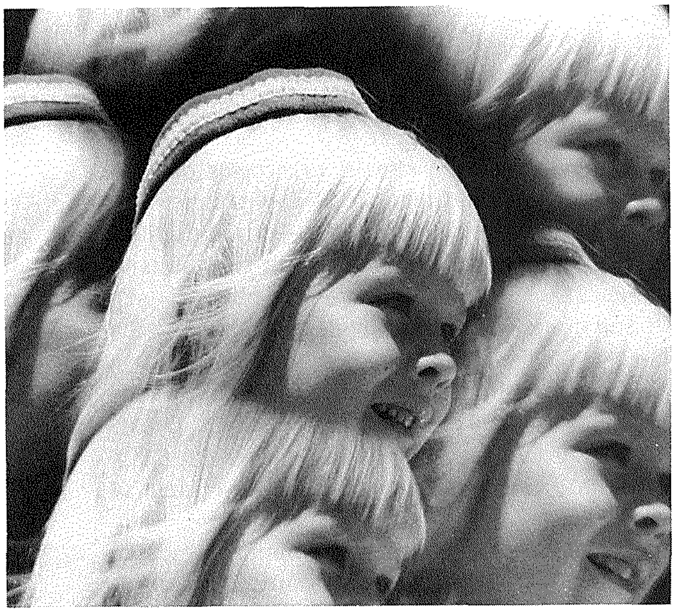
The diaphragm of the prime lens should be wide open when a fisheye attachment is used, and the control ring of the fish-eye should be set to the desired f-stop. For best definition, close down about two to three stops from maximum aperture.

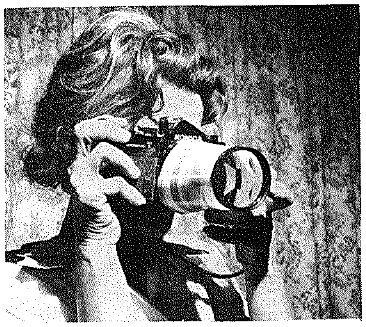
Multiple images require even simpler, less expensive attachments: filter-like prisms designed to produce three, five or six simultaneous images on one frame. Spiratone offers three models: the 3P, which produces three parallel images; the 3C, producing three concentric images, and the 5C that surrounds its central image with four secondary images. Prinz's Mirage is similar, with five secondary images surrounding its central one. Prices, depending on the size and model chosen, range between $9 and $20.

Though these prisms can attach to the front of almost any camera lens, reflex or view cameras are by far the best to use, since they let you place the secondary images exactly where you want them. The prisms also rotate in their mounts, to help you place images precisely; the concentric models may even be rotated during exposure, producing deliberately blurred images surrounding a sharp one.

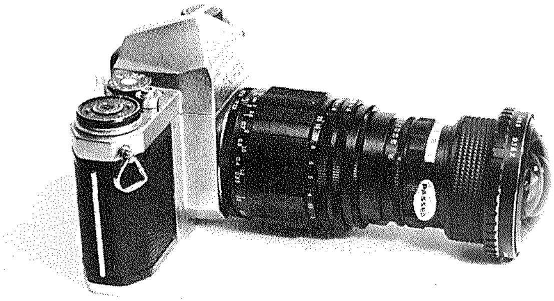
For more clear-cut images, mount the prism in front of the lens. A paper cup, its inside sprayed with flat black paint, can be used to mount the prism this way.

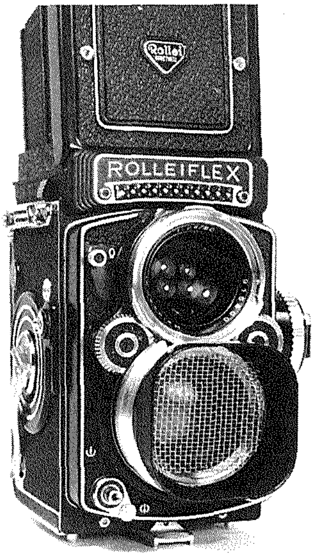
FILTER-SIZED prisms mounted in front of your camera lens give multiple images (right). You can pick from several prism types. Some give five concentric images as in this example; others give fewer. Some give three parallel images. Multiple-image prisms are made to mount like filters, but they can be held an inch or two ahead of the lens. A paper cup can become a mount (below), but should be painted black first. And you must focus and set the lens before you cover it with the cup.

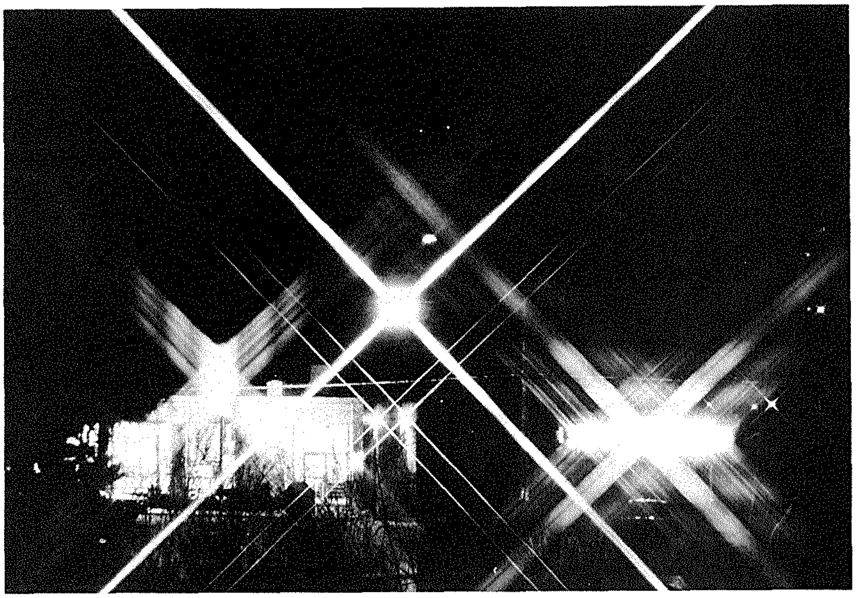




FISHEYE shots (left) take in an ultrawide, 180° angle. But, unlike true wide-angle lenses, these curve the scene before them with the effect increasing toward the edges. (The face here, since it's in the picture's center, is less curved by the fisheye than it is distorted by proximity to the lens.) Fisheye attachments (right) fit nearly any lens, start at about $60. Used on wide-angle lenses, they produce full circles; used with normal-length lenses, their circles' outer edges may go beyond the edges of the film and be lost.







SPARKLING STARS SPREAD out from lights in night scenes or from sharp highlights in daytime photos when you use commercial or homemade star filters. To make one, simply cut a piece of screen to fit your lens hood or filter holder. For eight-pointed stars, use a second layer of screen. This simplified method may reduce contrast.

Multi-image prisms don't affect exposure, but they may cut off the corners of the picture at small apertures. Check this by previewing your pictures with the lens stopped down to the f-stop you're actually shooting at.

Star effects—long streaks or crosses of light surrounding strong highlights in daylight pictures, or light sources in night scenes—can add glitter and sparkle to your shots. You can buy filters to produce these effects, or make your own.

Spiratone has three models available: the Crostar 2P, which extends highlights along a single line, and the 1SQ and 2SQ, which produce crossed highlights. Prinz markets the Cross-Screen, producing an effect like that of the 2SQ. Prices are around $5 to $10, about the same as other filters.

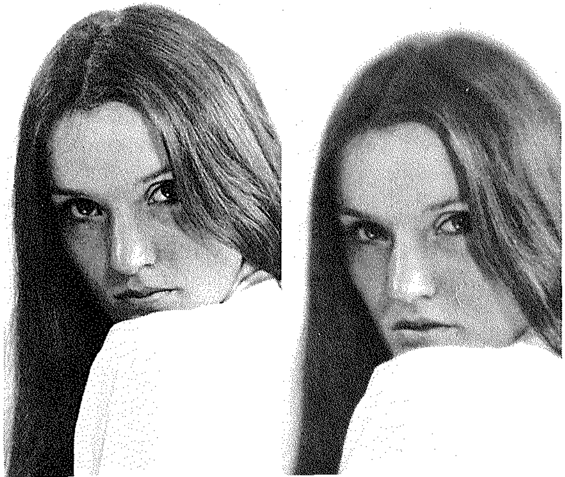
To make your own, use aluminum screen patches (or scraps from discarded screens), either cut to fit your filter holder or simply crimped inside a lens hood. These homemade attachments diffuse the image more than commercial ones do, reduce contrast; and they can't be rotated as easily to orient the starlines where you want them.

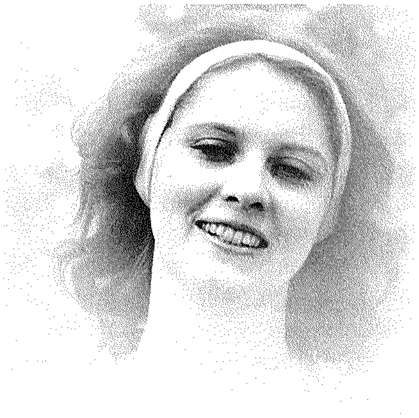
If you combine two star attachments at right angles, you'll get eight-pointed stars. The angle between the points will vary if you vary the angle between the grids of the attachments.

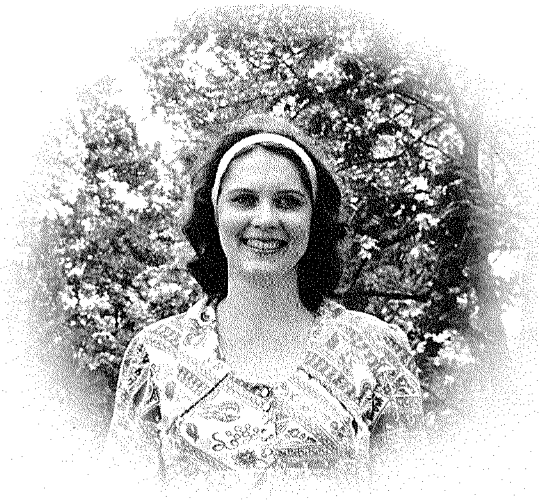
Vignetting, or gradually blanking out the edges of a picture, is a time-honored technique to focus attention on a subject by separating it from its background. It's usually done in the darkroom, but it's even easier to do it in your camera—and that way, you can vignette your color slides as well.

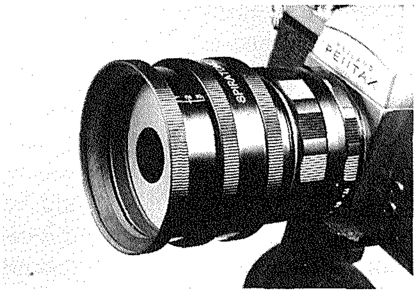
For maximum control of your vignetting effects, you can use Spiratone's Vignetar attachment (about $16.00), which is adjustable for sharply or softly defined vignettes. Prinz has a spot filter that is not adjustable, but—at around $6.00—is even less expensive. Or you can make your own by rubbing petroleum jelly around the outer portions of a haze filter; here, the effect will vary with the thickness of the coating and

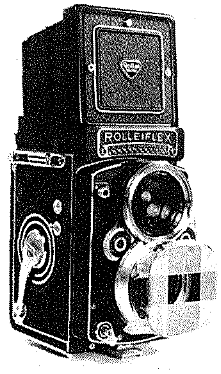
SOFT-FOCUS effect (right) makes antique-looking portraits and hides blemishes. This shot was made with Spiratone's Portragon soft-focus 100-mm f/4 lens.











VIGNETTING SOFTENS photos' appearance and hides distracting backgrounds for another touch of the old-fashioned. Effects vary with the lens (135-mm, top left; 50-mm, top right) and type of attachment. Nonadjustable, homemade types include frosted cellophane tape (right) and a clear filter, its edges smeared with petroleum jelly as at the far right.

the size of the clear central spot. (You can get a similar effect by applying Scotch Magic cellophane tape to a lens hood.)

Longer lenses will enlarge the center spot and soften the edge of the vignette (too long a lens will integrate the spot and vignette into an overall haze). But smaller f-stops sharpen the edge, so you can juggle focal length and f-stop to get precisely the effect you want.

Diffusion and soft focus are also interesting portrait techniques, which soften the image for a more romantic effect and simultaneously minimize skin blemishes.

Diffusion is the milder of the two effects, gently lowering overall contrast by spreading light from the highlights into the shadows. Diffusion filters are available from Prinz, Spiratone and others for about the cost of ordinary filters. You can also make your own by stretching one or more layers of nylon stocking over a filter holder (use black or black-dyed nylon stockings in your color shots).

In cool weather, you can fog the lens by breathing on it, then shoot at the instant the lens has cleared enough to give you the exact effect you want.

Soft-focus, a stronger effect than diffusion, is usually associated with professional portraiture. It's not the same as incorrect focus, but rather a combination of a sharply focused image with an unsharp image that is formed by the lens's aberrations.

Spiratone's Portragon (about $25) is a 100-mm lens (a good focal length for portraiture) with such aberrations deliberately designed in. Its aperture is fixed at f/4; you control exposure by your choice of shutter speed.

Similar products are widely available. If your store doesn't have what you want, get Spiratone products from Spiratone, Inc., 135—6 Northern Blvd., Flushing, NY 11354; Prinz from Bass Camera Co., 179 West Madison St., Chicago, IL 60602. The prices in this article are, of course, subject to change.

Frame movies with a matte box

Here's a Hollywood-style special-effects device that you can adapt to almost any home-movie camera. It gives your movies that professional look

By JAMES R. OSWALD

▨ USING SOME NEARBY OBJECTS to put a frame around your movie shots can make a good shot even better, by adding depth and atmosphere to a pretty scene that might otherwise look flat and dull on your screen. Look carefully, and you'll find suitable objects all around you—overhanging trees, picturesque archways, portholes, windows—the list is limited only by your imagination, by what the subject of your particular shot calls for, and by the location of these natural frames.

SEE ALSO

Boating photography . . . Dryers, photo . . .
Exposure meters . . . Lenses, photo . . .
Night photography . . . Outdoor photography . . .
Photo hints . . . Used cameras

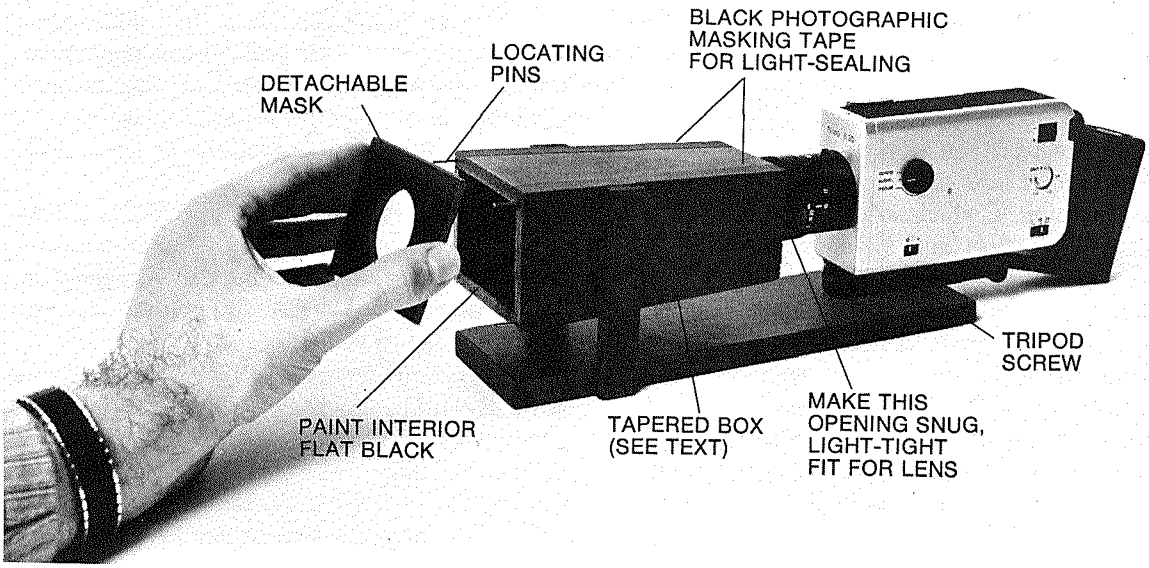
But often the right object to silhouette in your foreground isn't quite in the right place to frame your subject. And sometimes you may want to spice a shot with a frame not naturally on the scene—a keyhole, perhaps, or the overlapping circles of movie "binoculars" (real binoculars, of course, show more of a fuzzy oval than the sharp figure-8 pattern the movies show you).

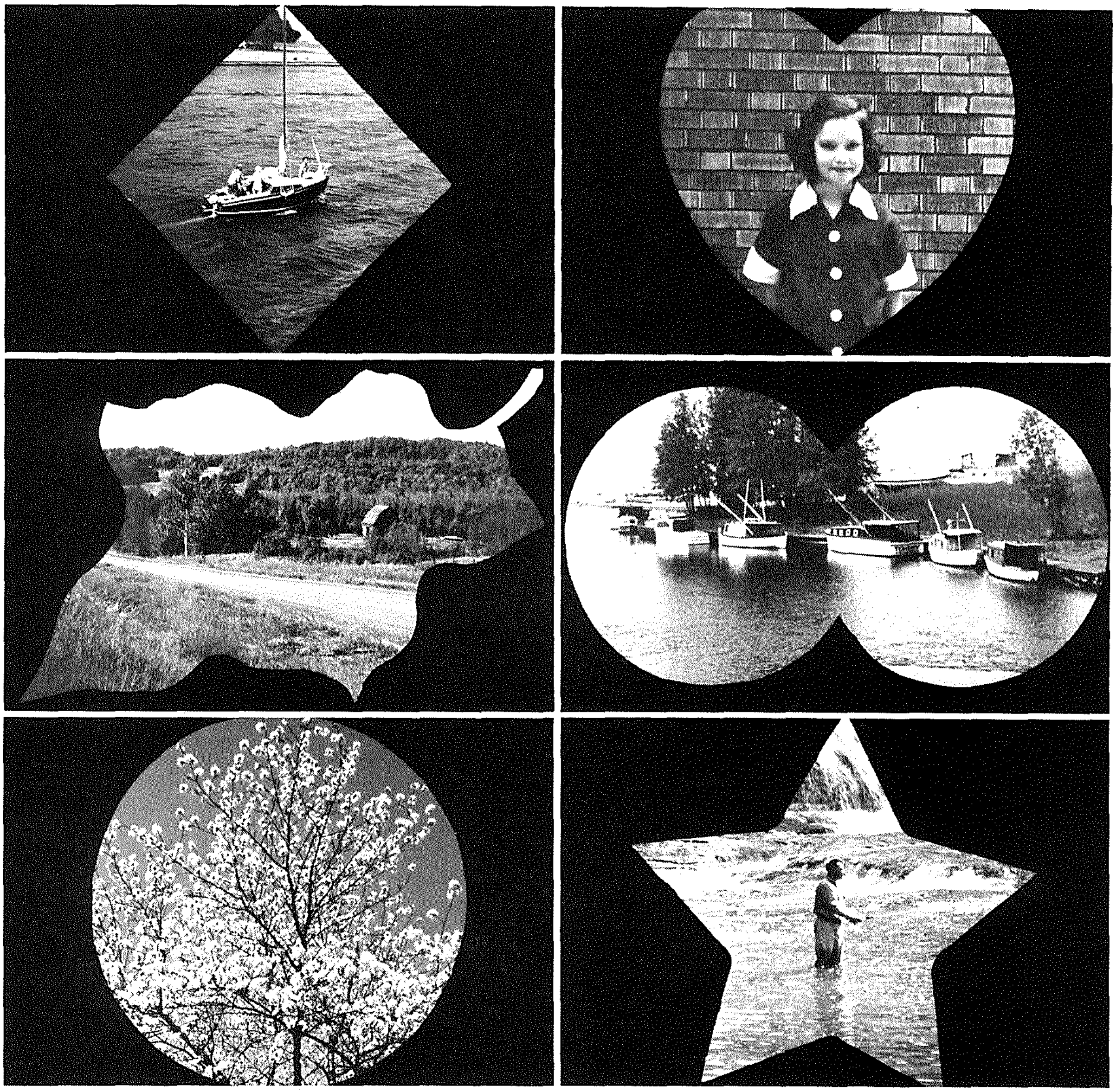
Professional filmmakers always have the frames they need, though, whenever they need them. Their frames are small cutouts called "mattes," attached to their cameras with simple devices called "matte boxes." The effect is quite professional—but the construction of a matte box is so simple that you can easily build your own.

It's basically just a tapered, light-tight box painted black inside, with a round hole at its small end to admit the camera lens, and provision for mounting interchangeable framing masks over the other end. Dimensions vary from camera to camera. The small end of the box should be just large enough to admit the front of your lens.

The dimensions of the other end will depend upon the type of lens you have: With a zoom lens, you should be able to see the edges of any mask in your finder when the lens is set to its shortest focal length, yet be unable to see the mask when the lens is zoomed to its telephoto position. With a nonzoom lens, you want the edges of the mask to be visible when the mask is mounted, but for the edges of the mattebox to be out of the frame

CONSTRUCTION IS SIMPLE, but the dimensions must be adapted to the particular lens and camera model.


DETACHABLE MASK
LOCATING PINS
BLACK PHOTOGRAPHIC MASKING TAPE FOR LIGHT-SEALING
TRIPOD SCREW
PAINT INTERIOR FLAT BLACK
TAPERED BOX (SEE TEXT)
MAKE THIS OPENING SNUG, LIGHT-TIGHT FIT FOR LENS



THE VARIETY OF MATTES is unlimited. Besides these, others could be cut from photos of trees or other subjects.

when the mask is off. The mask size also depends on the length of the box—and the length must be a compromise; the longer you make it, the more sharply outlined your matte frame will be—but the more ungainly and harder to handle the box will be, too.

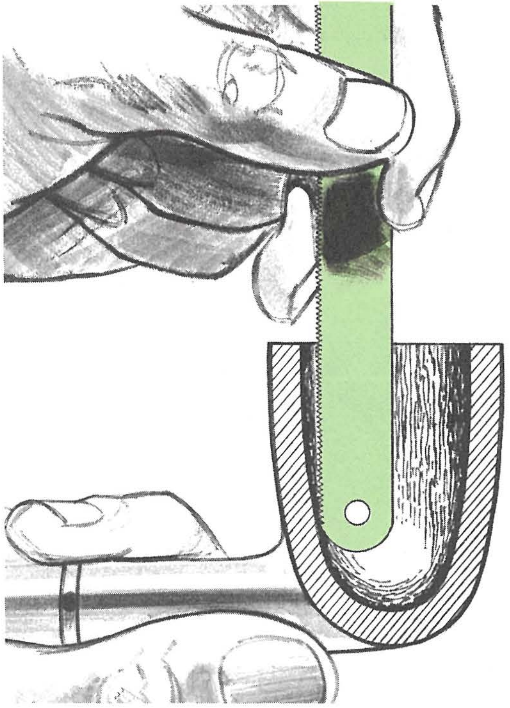
Both the top and sides of the box should taper evenly and symmetrically, and the box's cross section should be a rectangle, approximately three quarters as high as it is wide.

With most cameras, the box will have to sit on struts above the baseboard, as mine does; again, the height of the struts depends on the camera. You can make your box from ¼-inch hardboard, plywood, opaque plastic, or what have you. Suitable scraps of wood can usually be picked up from lumberyards for a song. For the base, use ½-inch lumber. Drill the base below the tripod-screw socket, and let your tripod's screw hold both the camera and the matte box assembly.

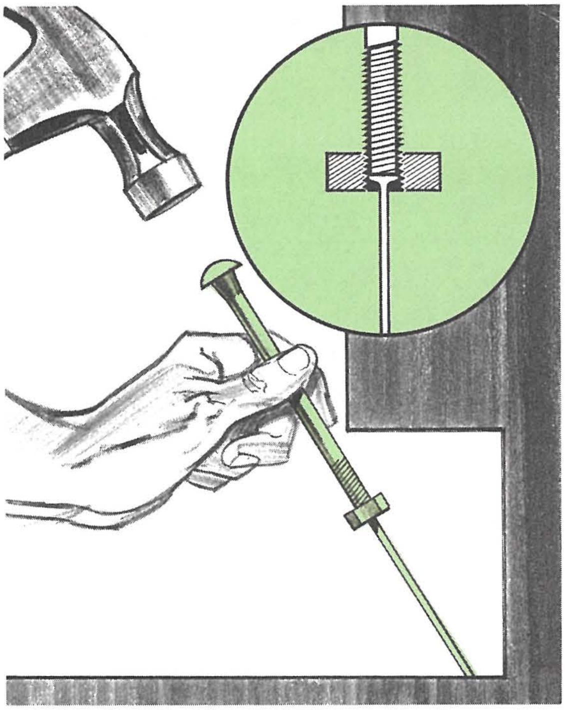
The mattes themselves can be cut from ⅛-inch hardboard, wood, cardboard, or similar material. Four ¾-inch brads in the corners of the box's "window" end mate with small holes in the matte's corners to hold them in place.

To finish, tape the corners of the box with black photographic tape to prevent light leaks, and kill interior reflections by painting the inside of the box with flat black paint.

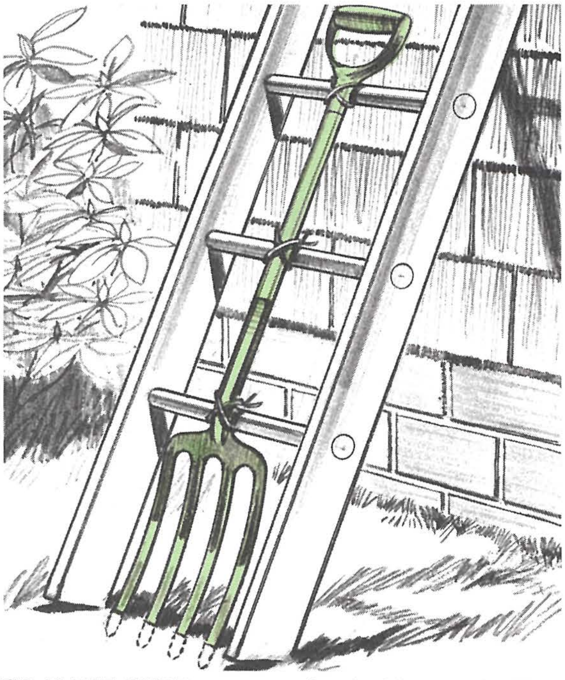
A few of the possible effects are shown above.



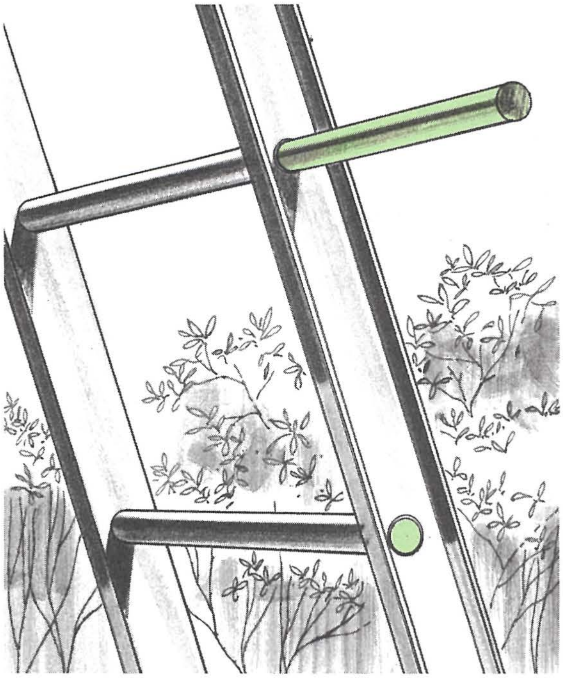
WHEN THE ASH COATING needs scraping from the bowl of your pipe, a piece of hacksaw blade makes a fine reamer. The teeth are perfect for scraping and the rounded end of the blade won't harm the bowl.—*S. H. Rynk*



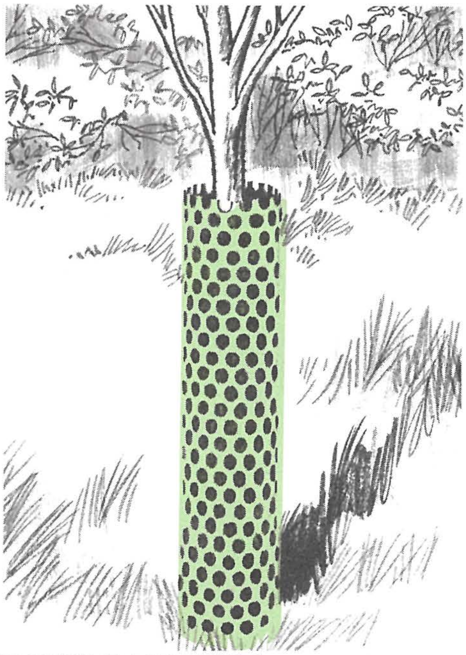
DRIVING A NAIL in an inaccessible spot is no problem if you use a carriage bolt. Turn nut partway on the end so bolt won't slip off the nail and use the bolt like a regular nailset.—*Victor H. Lamoy*



TO MAKE SURE an extension ladder won't slip when standing on wet grass, anchor it with a spading fork. Simply press it in the ground and secure the handle to the bottom rungs with wire. —*Victor H. Lamoy*

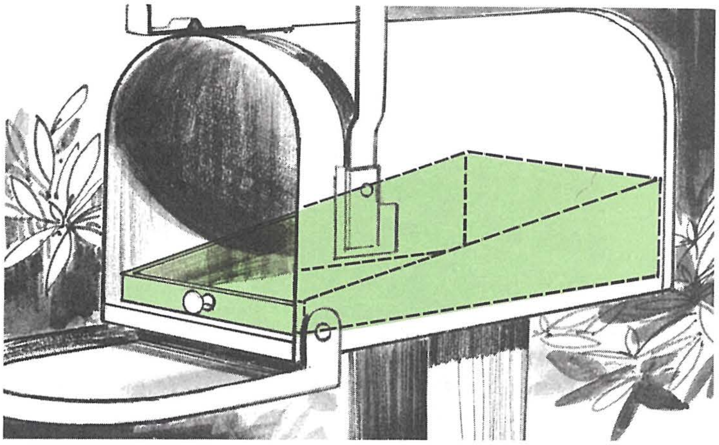


WHEN YOU BUY a new aluminum ladder with tubular rungs, it's a good idea to insert wood dowels in the rungs as soon as you get it. Snug-fitting dowels will keep the rungs from bending.—*John Krill*

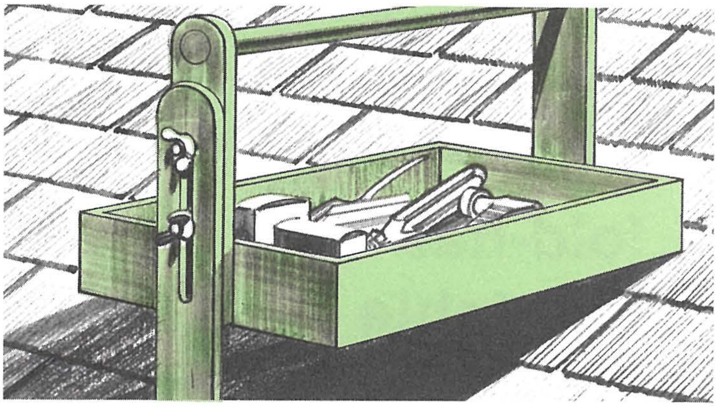


IF YOU'RE LOOKING for a way to protect a young fruit tree from gnawing rabbits, use a piece of expanded metal lath. Form it into a sleeve around the tree and embed the end in the ground. It's neat looking and will last indefinitely.—*John Krill*

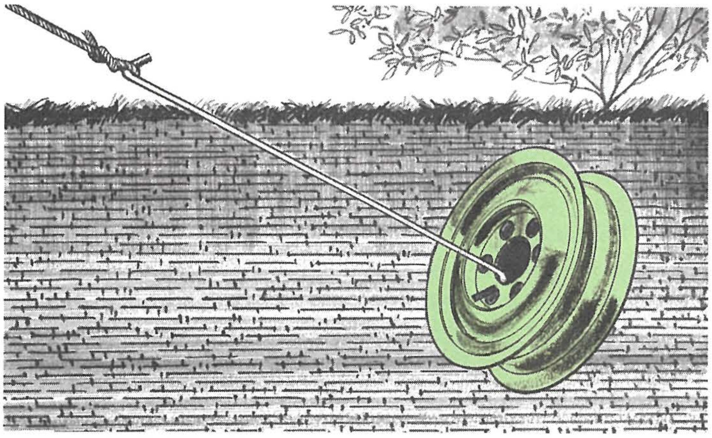
AN OLD BROOM is a handy thing to use to hold the chisel when breaking up concrete. It will keep your hand a safe distance away, and the bristles will safeguard you from flying bits. Simply force chisel through the whisks.—*Wilfred Beaver*



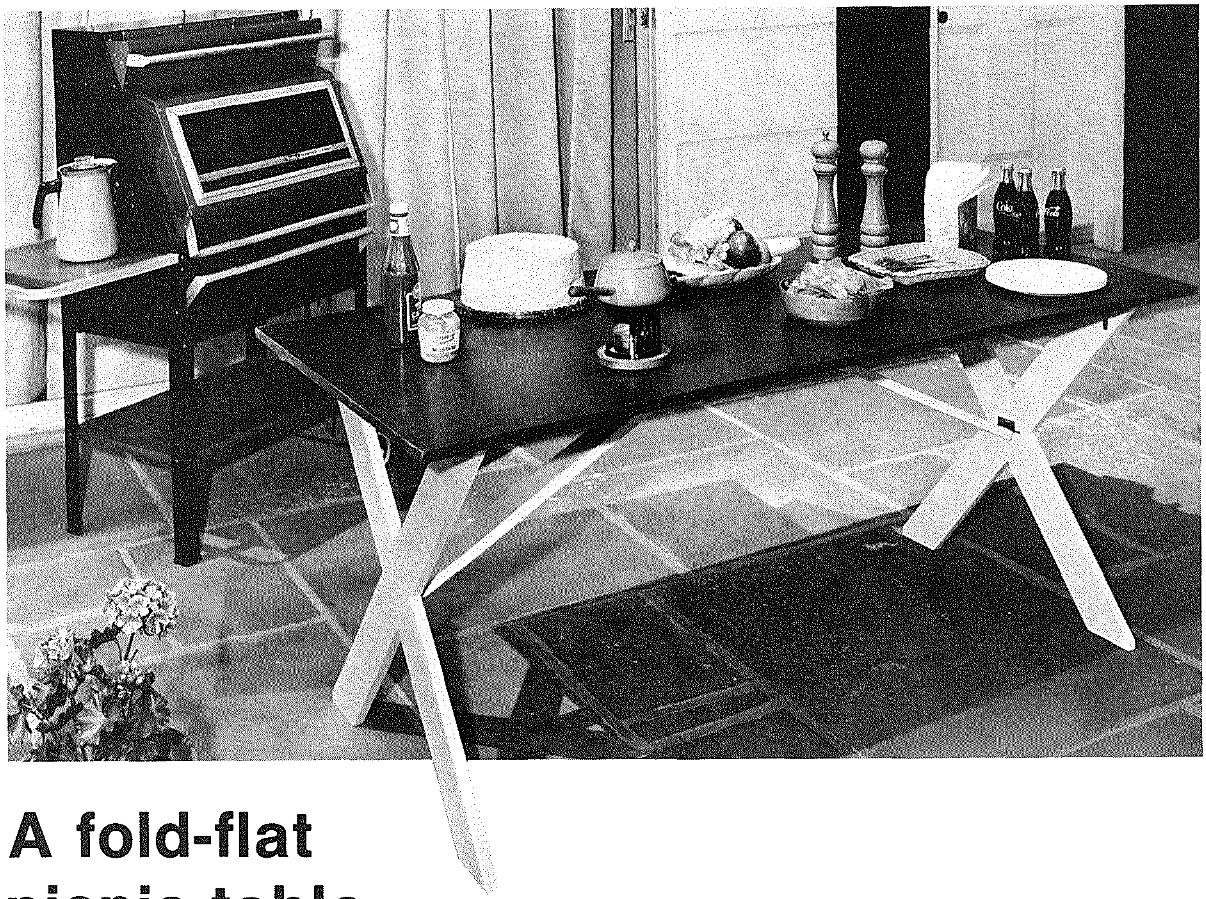
A TRAY IN YOUR MAILBOX will make it easy for short members of the family to reach letters in the back of the box. Form it as shown from sheet metal so it will slide easily in the box and add a small drawer knob to the front.—*Victor H. Lamoy*



YOUR TOOL TRAY WILL SIT LEVEL on any roof if you fit it with an adjustable leg. Simply slot a narrow board to fit over two carriage bolts inserted through the tray handle and add wingnuts and washers to lock it at right height.—*Daniel Bousha*



A BURIED AUTO WHEEL makes a dandy anchor for a fence brace. Form an eye at one end of a steel rod, a hook at the other and hook rod through a wheel lug hole. Then bury the wheel as shown and tamp dirt firmly around it.—*Victor H. Lamoy*



A fold-flat picnic table

By PAUL BELL

▩ THE BIG PROBLEM with a conventional back-yard picnic table is that you can't put it away between cookouts. It's just too big to store—which means it's in the way when you mow the lawn, and it takes a beating from the weather. The latter means you'll have an annual paint or stain job.

You don't have such problems with this patio table. When the party's over, it can be stored in a minimum of space in your garage. With legs folded, it takes only 2¼ in. of space.

The table is sturdy when it's set up; the sawbuck-type legs are braced by their hinged supports. The braces not only lock the legs in the open position; they also lock them when folded—by using a pair of regular loose-pin hinges and substituting pull pins made from coathanger wire for the original hinge pins.

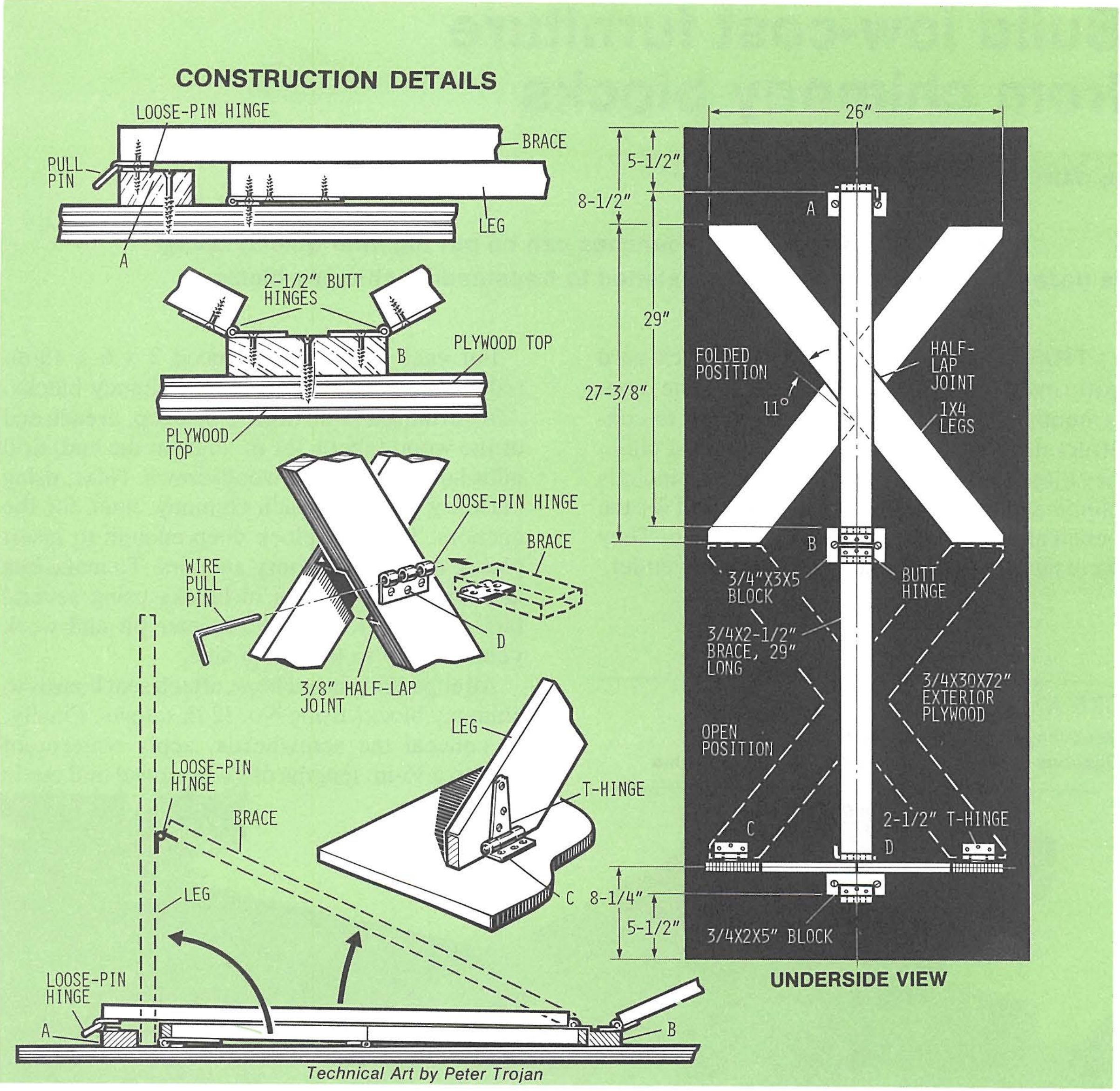
You can increase the size of the top, but if you maintain the 5½-in. dimension at the ends, you'll have to increase the length of the braces accordingly.

Block B is glued and screwed to the underside of the plywood top at its exact center. Although the braces are hinged to this block with plain butt hinges, you'll see in the enlarged detail that the braces are on the top of the hinge leaf and the screws are turned in from the rear side of the leaf.

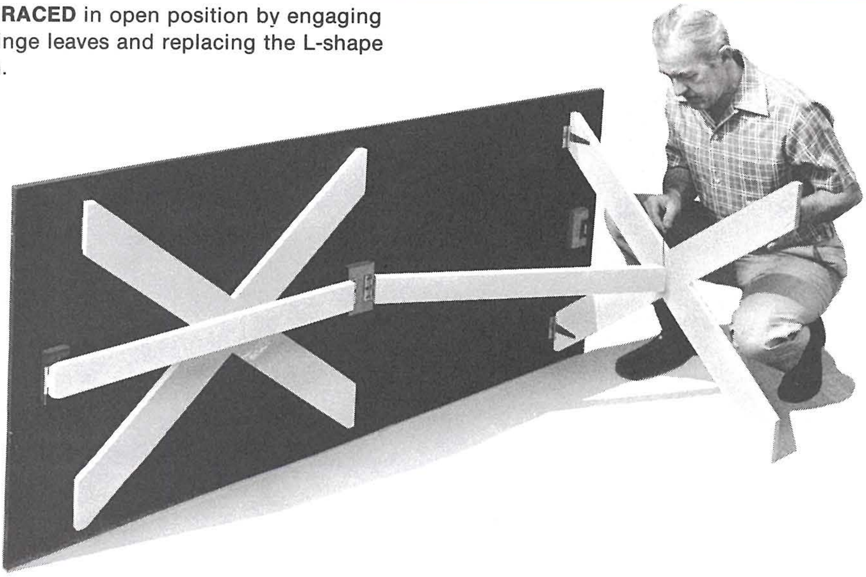
The 1x4s, which are used to make the legs should lap flush at the point where the members cross. To cut the dadoes at the correct angle, set your saw miter gauge at 11°.

Use three loose-pin hinges (six leaves). One leaf is screwed to each end of the braces. Another is screwed to each block A and the other two are screwed to the inside of each leg assembly. Thus, single leaves at ends of the braces engage the single leaves screwed to the legs as well as to those screwed to blocks A. To set up the table you pull the hinge pin at blocks A, swing up the legs to engage the hinge leaf of the brace with the one on the legs and replace the wire pull pin.

SEE ALSO
**Barbecues . . . Cookout bars . . . Firepits . . .
Grill houses . . . Patios**



Technical Art by Peter Trojan



LEG IS BRACED in open position by engaging mating hinge leaves and replacing the L-shape hinge pin.

Build low-cost furniture from chimney blocks

By GARY GERBER

A picnic table and matching benches can be put together quickly using few tools because the redwood is simply fastened to freestanding chimney blocks

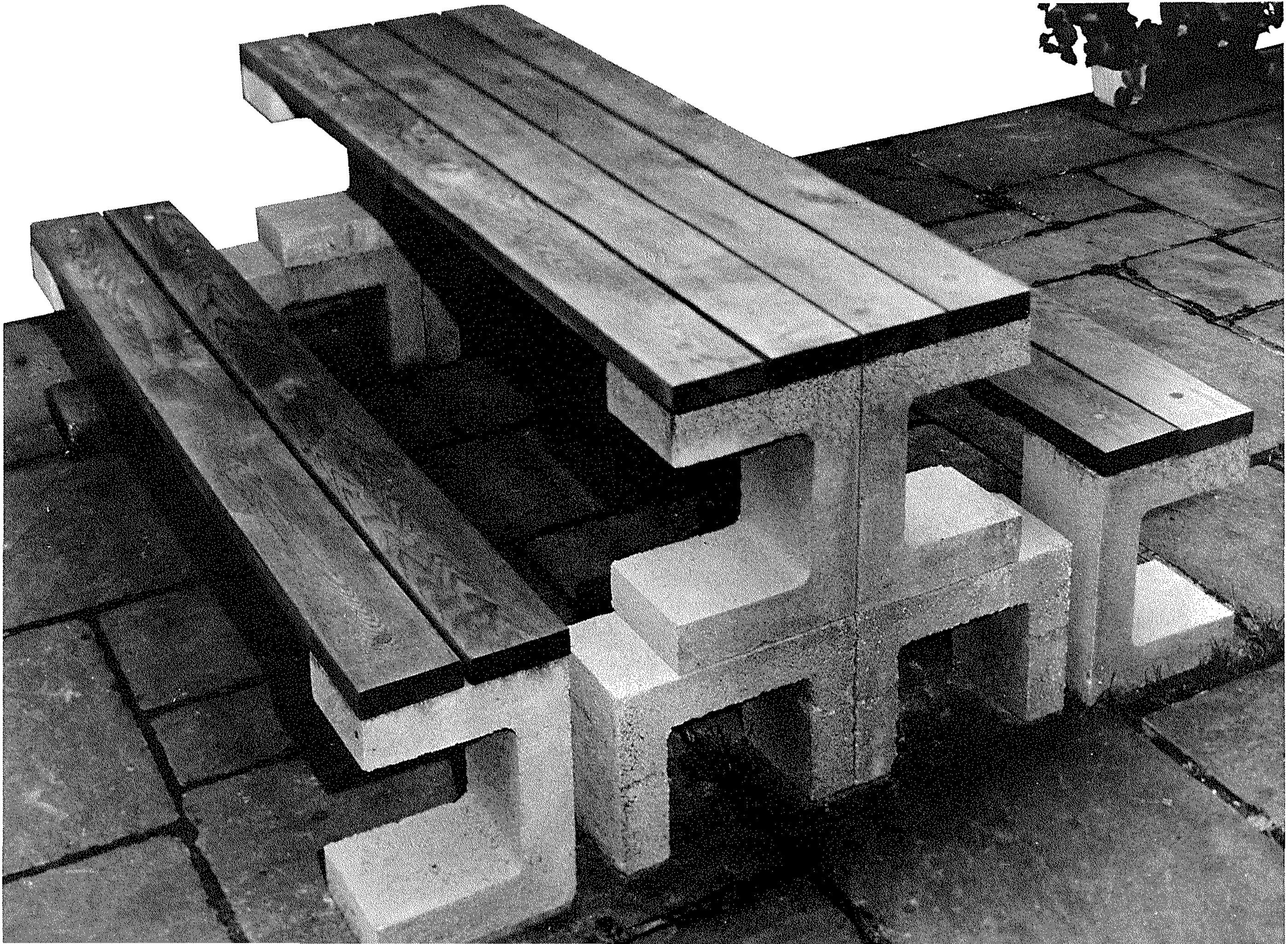
THIS SUMMER you'll enjoy your back-yard patio even more if you add this handsome, contemporary furniture to the scene. Easy to construct, these sturdy pieces have low-cost chimney blocks for legs; a lot of high-priced lumber is eliminated from the project. Blocks used for the bench and seats cost around $1.00 apiece. They were purchased at a local mason's supply outlet.

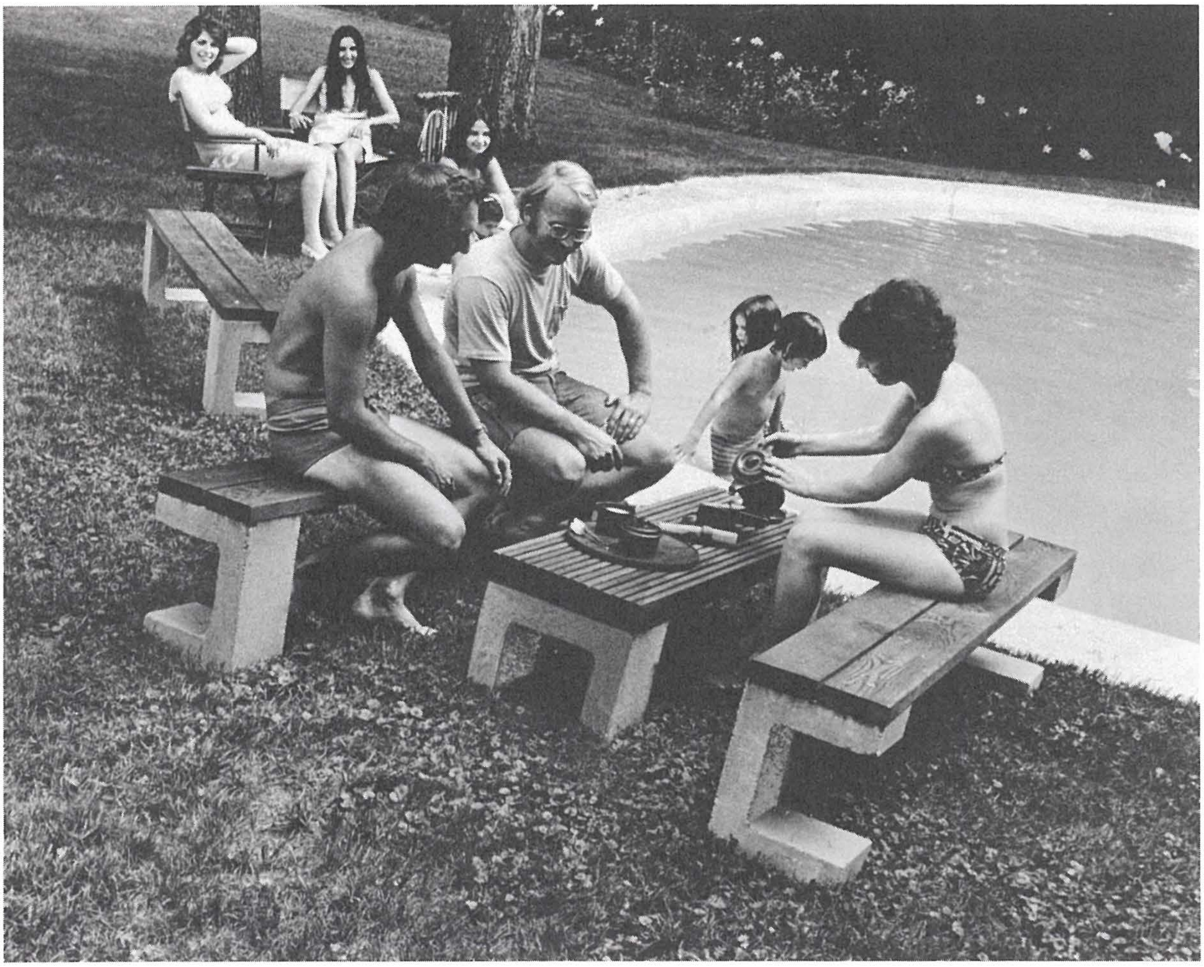
SEE ALSO

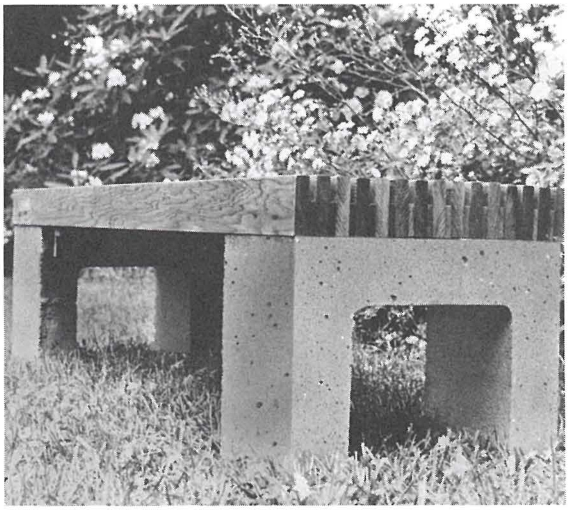
Benches, deck . . . Concrete blocks . . . Decks . . . Gazebos . . . Patios . . . Screened summer rooms

For each bench, you'll need 2 x 6 x 48-in. redwood boards and a pair of chimney blocks. After drilling a ¾-in. hole ½-in. deep, in each end of the wood (about 3¼ in. in from the end) drill pilot holes for No. 12 woodscrews. Next, using masonry bits, drill each chimney block for the anchors. Drill the block deep enough to insert plastic or metal masonry anchors. To make bits last longer, drill holes in blocks using several bits. Start with a small-diameter bit and work your way up to the finish size.

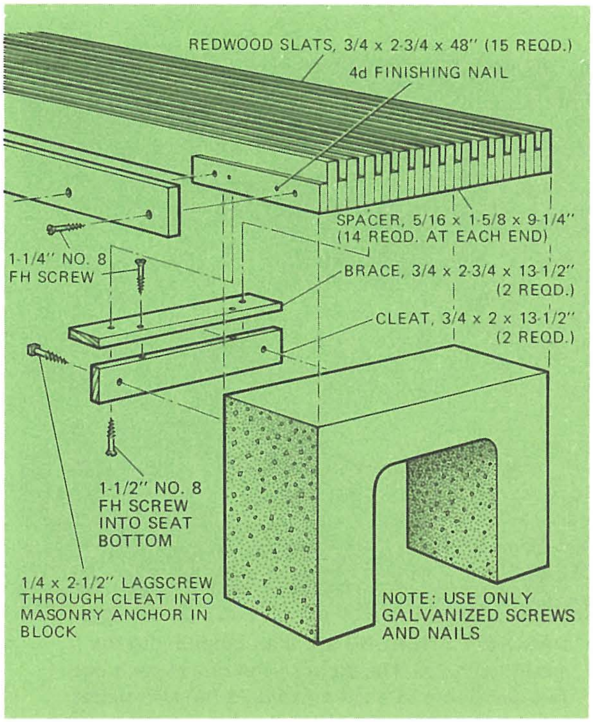
After pushing in anchors, attach seat boards to chimney blocks using No. 12 fh screws. Finally, to conceal the screwheads, apply waterproof glue to a ½-in. lengths of ¾-in. dowel and tap in







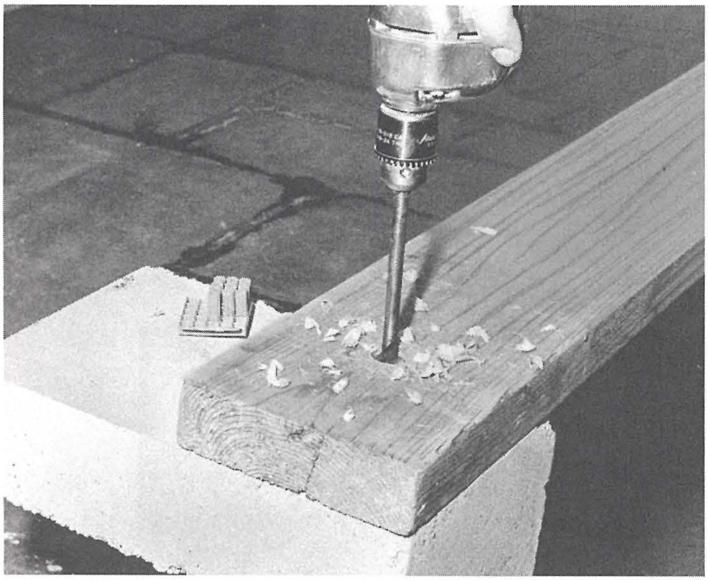
SLATTED COFFEE table is a slight variation of the furniture shown on the facing page. The ¾-in. redwood stock is separated by spacers, and the seat assembly is fastened to the blocks with galvanized screws and masonry anchors.


REDWOOD SLATS, 3/4 x 2-3/4 x 48" (15 REQD.)
4d FINISHING NAIL
SPACER, 5/16 x 1-5/8 x 9-1/4" (14 REQD. AT EACH END)
1-1/4" NO. 8 FH SCREW
BRACE, 3/4 x 2-3/4 x 13-1/2" (2 REQD.)
CLEAT, 3/4 x 2 x 13-1/2" (2 REQD.)
1-1/2" NO. 8 FH SCREW INTO SEAT BOTTOM
1/4 x 2-1/2" LAGSCREW THROUGH CLEAT INTO MASONRY ANCHOR IN BLOCK
NOTE: USE ONLY GALVANIZED SCREWS AND NAILS

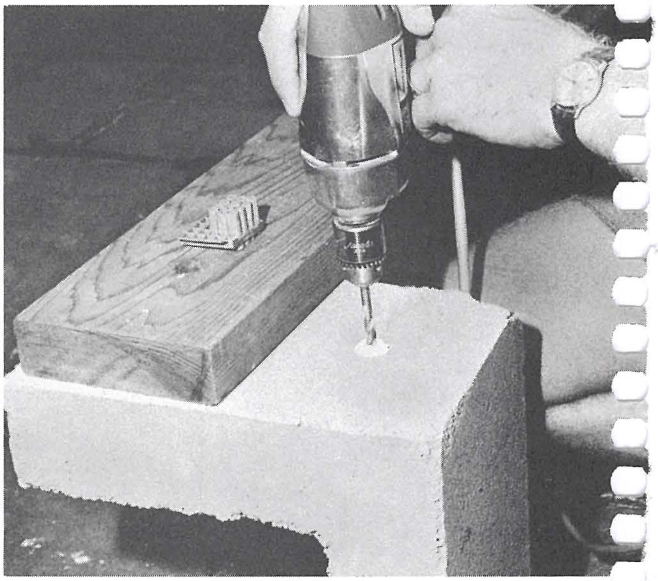
dowels. To make the table, place two benches back-to-back atop two pairs of chimney blocks as shown in the photo on page 2302. I've found the table is sturdy enough without tying the two benches together, and you retain the flexibility of being able to take apart the table to create two benches.

To build the coffee table with slatted top, use 14 spacers at each end of the table to separate the 15 redwood boards. Fasten the spacers to each board with 4d finishing nails, and tie them all together with an L-shaped brace on the bottom which, in turn, is fastened to each chimney block.

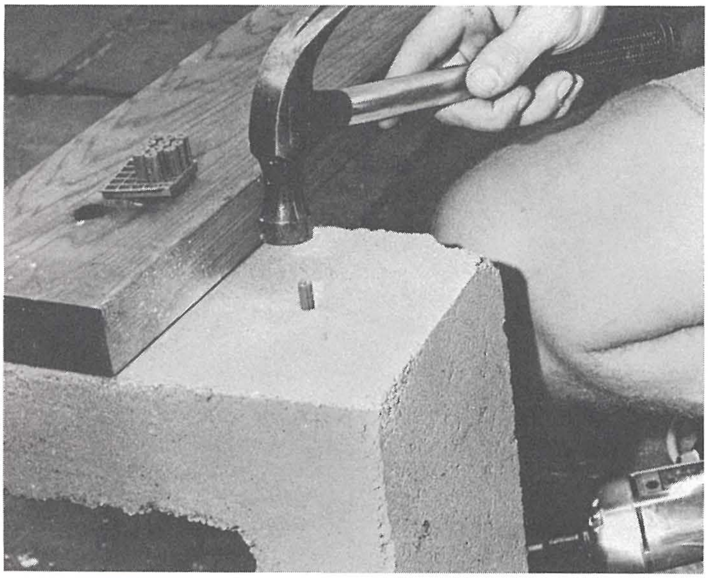
For eye-appeal, give the blocks one coat of pastel-shade masonry paint.



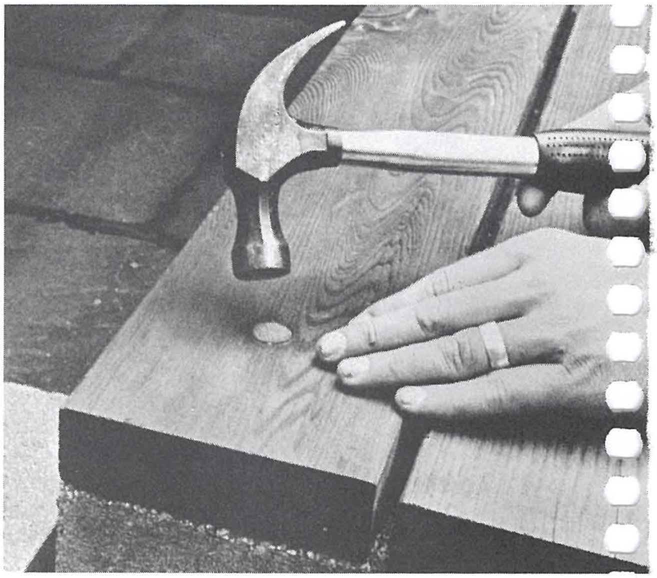
1 **BENCH SEAT BOARDS** are cut to length, positioned on blocks, and ¾-in. holes are drilled through. Tip of bit marks spot where you drill.



2 **HOLES IN MASONRY** should be bored in stages to make bits last longer. Start with a small bit and work your way up to the desired diameter.



3 **MASONRY ANCHORS** are then tapped into the predrilled holes. The author used one at each end. Two per board at each end would be even better.



4 **FLATHEAD SCREW** is turned home in counterbored hole; ¾-in.-dia. dowel plug hides screwhead. Use waterproof glue to assure dowel stays put.

METRIC CONVERSION

Conversion factors can be carried so far they become impractical. In cases below where an entry is exact it is followed by an asterisk (*). Where considerable rounding off has taken place, the entry is followed by a + or a - sign.

CUSTOMARY TO METRIC

Linear Measure

inches	millimeters
1/16	1.5875*
1/8	3.2
3/16	4.8
1/4	6.35*
5/16	7.9
3/8	9.5
7/16	11.1
1/2	12.7*
9/16	14.3
5/8	15.9
11/16	17.5
3/4	19.05*
13/16	20.6
7/8	22.2
15/16	23.8
1	25.4*

inches	centimeters
1	2.54*
2	5.1
3	7.6
4	10.2
5	12.7*
6	15.2
7	17.8
8	20.3
9	22.9
10	25.4*
11	27.9
12	30.5

feet	centimeters	meters
1	30.48*	.3048*
2	61	.61
3	91	.91
4	122	1.22
5	152	1.52
6	183	1.83
7	213	2.13
8	244	2.44
9	274	2.74
10	305	3.05
50	1524*	15.24*
100	3048*	30.48*

1 yard = .9144* meters

1 rod = 5.0292* meters

1 mile = 1.6 kilometers

1 nautical mile = 1.852* kilometers

Fluid Measure

(Milliliters [ml] and cubic centimeters [cc or cu cm] are equivalent, but it is customary to use milliliters for liquids.)

1 cu in = 16.39 ml
1 fl oz = 29.6 ml
1 cup = 237 ml
1 pint = 473 ml
1 quart = 946 ml
= .946 liters
1 gallon = 3785 ml
= 3.785 liters

Formula (exact):
fluid ounces × 29.573 529 562 5* = milliliters

Weights

ounces	grams
1	28.3
2	56.7
3	85
4	113
5	142
6	170
7	198
8	227
9	255
10	283
11	312
12	340
13	369
14	397
15	425
16	454

Formula (exact):
ounces × 28.349 523 125* = grams

pounds	kilograms
1	.45
2	.9
3	1.4
4	1.8
5	2.3
6	2.7
7	3.2
8	3.6
9	4.1
10	4.5

1 short ton (2000 lbs) = 907 kilograms (kg)

Formula (exact):
pounds × .453 592 37* = kilograms

Volume

1 cu in = 16.39 cubic centimeters (cc)
1 cu ft = 28 316.7 cc
1 bushel = 35 239.1 cc
1 peck = 8 809.8 cc

Area

1 sq in = 6.45 sq cm
1 sq ft = 929 sq cm
= .093 sq meters
1 sq yd = .84 sq meters
1 acre = 4 046.9 sq meters
= .404 7 hectares
1 sq mile = 2 589 988 sq meters
= 259 hectares
= 2.589 9 sq kilometers

Kitchen Measure

1 teaspoon = 4.93 milliliters (ml)
1 Tablespoon = 14.79 milliliters (ml)

Miscellaneous

1 British thermal unit (Btu) (mean) = 1 055.9 joules
1 calorie (mean) = 4.19 joules
1 horsepower = 745.7 watts
= .75 kilowatts
caliber (diameter of a firearm's bore in hundredths of an inch) = .254 millimeters (mm)
1 atmosphere pressure = 101 325* pascals (newtons per sq meter)
1 pound per square inch (psi) = 6 895 pascals
1 pound per square foot = 47.9 pascals
1 knot = 1.85 kilometers per hour
25 miles per hour = 40.2 kilometers per hour
50 miles per hour = 80.5 kilometers per hour
75 miles per hour = 120.7 kilometers per hour

METRIC TO CUSTOMARY

Linear Measure

millimeters (mm)	fractions of an inch (to nearest 1/64")
1	3/64 −
2	5/64 +
3	7/64 −
4	11/64 −
5	13/64 −
6	15/64 +
7	17/64 +
8	5/16 +
9	23/64 −
10	25/64 +

Formula:
millimeters × .039 37 = inches

centimeters (cm)	inches (to nearest 1/64")
1	25/64 +
2	25/32 +
3	1 3/16 −
4	1 37/64 −
5	1 37/32 −
6	2 23/64 +
7	2 3/4 +
8	3 5/32 −
9	3 35/64 −
10	3 15/16 −

Formula:
centimeters × .393 7 = inches

meters	feet (to nearest 1/4 inch)
1	3′ 3 1/4 + ″
2	6′ 6 3/4 − ″
3	9′ 10 + ″
4	13′ 1 1/2 + ″
5	16′ 4 3/4 + ″
6	19′ 8 1/4 − ″
7	22′ 11 1/2 + ″
8	26′ 3 − ″
9	29′ 6 1/4 + ″
10	32′ 9 1/2 + ″

Formula:
meters × 3.280 8 = feet
1 kilometer = 3280.839 8 feet
= .621 371 miles

Fluid Measure

1 milliliter (ml) = .034− oz (fluid ounces)
10 ml = .34− oz
100 ml = 3.4− oz
1 liter = 33.8 + oz
= 2 pints, 2− oz
= 1 quart, 2− oz

Formulas:
liters × 33.814 056 = ounces (fluid)
milliliters × .033 814 056 = ounces (fluid)

Weight

grams	ounces (avoirdupois)
1	.035 +
10	.353 −
50	1.76 +
100	3.52 −
500	1 lb 1.7− oz
1000	2 lb 3.3− oz

Formula:
grams × .035 273 99 = ounces (avoirdupois)

kilograms	pounds (to the nearest ounce)
1	2 lb 3 + oz
2	4 lb 7− oz
3	6 lb 9 + oz
4	8 lb 13 + oz
5	11 + lb
6	13 lb 4− oz
7	15 lb 7− oz
8	17 lb 10 + oz
9	19 lb 13− oz
10	22 lb 1− oz

Formula:
kilograms × 2.204 622 4 = pounds
1 metric ton (1000 kg) = 2 204.6 pounds

Volume

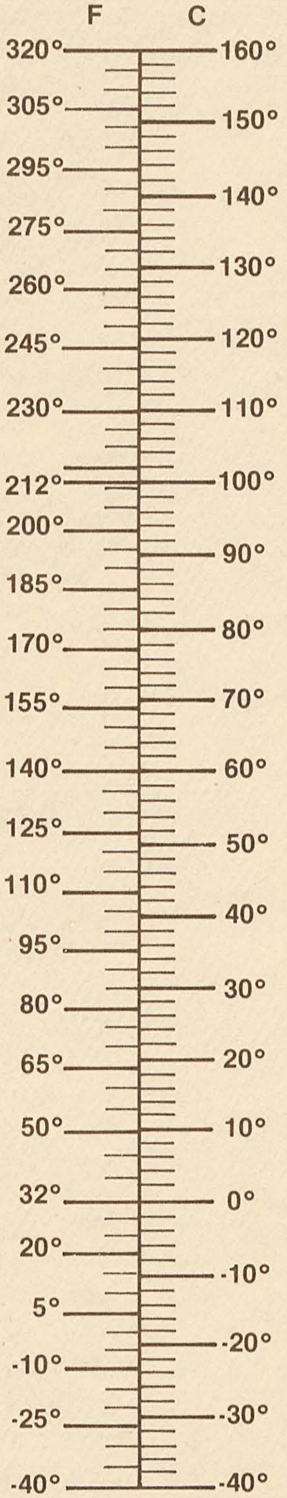
1 cubic centimeter (= 1 milliliter) = .061 + cubic inches
1 liter (1000 cc) = 61 + cubic inches
1 cubic meter = 35.3 + cubic feet

Area

1 square centimeter = .155 square inches
1 square decimeter = 15.5 square inches
1 square meter = 9.29 square feet
= .84− square yards
1 hectare (10 000 sq. meters) = 2.47 + acres

Miscellaneous

1 newton (N) = 4.45− pounds of force
1 pascal (Pa) (pressure) = .000 145 + psi
= .021− pounds per sq ft
1 kilopascal (kPa) = .145 + psi
= 21− pounds per sq ft
25 kilometers per hour (km/h) = 15.5 + mph
50 km/h = 31.1− mph
75 km/h = 46.6 + mph
100 km/h = 62.1 + mph
Formula:
km/h × .621 371 = miles per hour



32° Fahrenheit
= 0° Celsius

0° Fahrenheit
= −17.8° Celsius